NORTH HILLS CONTROLLED GROUND-WATER AREA PETITION

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared by

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

January 11, 2002

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List of Acronyms

af ..... Acre-feet of water
CDP ..... Census designated places
CGA ..... Controlled ground-water area
DEQ ..... Montana Department of Environmental Quality
DNRC ..... Montana Department of Natural Resources and Conservation
EA ..... Environmental assessment
EPA ..... United States Environmental Protection Agency
gpm ..... gallons per minute of water
MCA ..... Montana Code Annotated
MCL ..... . Maximum contaminant level
USGS ..... United States Geological Survey

Chapter 1. Purpose and Need

A controlled ground-water area is an area where water supply and water quality problems have been identified, or where there could be problems in the future. Water users can petition the state for the designation of a controlled ground-water area. The petition must be signed by one quarter or 20 of the ground-water users in the petition area, whichever is less. In controlled ground-water areas, the state has the authority to manage ground-water development. Outside of controlled ground-water areas, wells that yield less than 35 gallons of water per minute are exempt from most water-permitting requirements.

The Montana Department of Natural Resources and Conservation (DNRC) has received a petition to create a temporary controlled ground-water area (CGA) in the North Hills area in Lewis and Clark County just north of Helena. The petition has been signed by 120 area residents and requests that DNRC:

1) Perform a comprehensive hydrogeologic study of the area as needed to characterize and quantify the current and future availability of ground water;
2) Assess the nature and extent of changes in ground-water quality as a function of current and projected beneficial uses in the proposed North Hills CGA, in cooperation with the Montana Department of Environmental Quality (DEQ);
3) Close the area to further appropriation of ground water, except for replacement wells, during the term of the study.

Statute requires that petitioners for a CGA must provide facts showing that within the proposed CGA:

a) Ground-water withdrawals are in excess of recharge to the aquifer or aquifers;
b) excessive ground-water withdrawals are very likely to occur in the near future because of consistent and significant increases in withdrawals;
c) significant disputes regarding priority of rights, amounts of ground water in use by appropriators, or priority or type of use are in progress
d) ground-water levels or pressures are declining or have declined excessively;
e) excessive ground-water withdrawals would cause contaminant migration;
f) ground-water withdrawals adversely affecting ground-water quality are occurring or are likely to occur; or
g) water quality is not suited for a specific beneficial use as defined by 85-2-102(2)(a) MCA.

The petition contains allegations to comply with these requirements and has been deemed complete by DNRC. The petition is attached in the back of this draft EA as Appendix D. An evaluation of the above criteria by DNRC as it pertains to the North Hills area is included in Chapter 5.

1.1 Location

The proposed CGA would be in the North Hills area near Helena as depicted in Map 1.

1.2 Scope of the Environmental Analysis

This Environmental Assessment (EA) will assess potential impacts to the human environment if the petition for a CGA in the North Hills were granted, denied, or granted in a modified form. It will analyze the designation of a 2-year temporary CGA with a possible extension of 2 additional years: for four years total. The EA will evaluate the need for a controlled ground-water area, study and temporary closure, and the ability of the agencies to conduct a study. It will also present alternatives to the stipulations sought in the petition, but not a preferred alternative. Nor will the EA be the decision-making document. An administrative hearing process will be held to compile additional facts before DNRC makes a proposal for a decision on the petition.

1.3 Public Involvement

A public scoping meeting for this EA was held on Wednesday, November 7, 2001 at the Jim Darcy School, which is within the boundaries of the proposed CGA. The purpose of the meeting was to identify potential environmental issues and alternatives, and to provide information regarding the petition and DNRC's administrative requirements. The public was also given the opportunity to submit written comments until November 15, 2001.

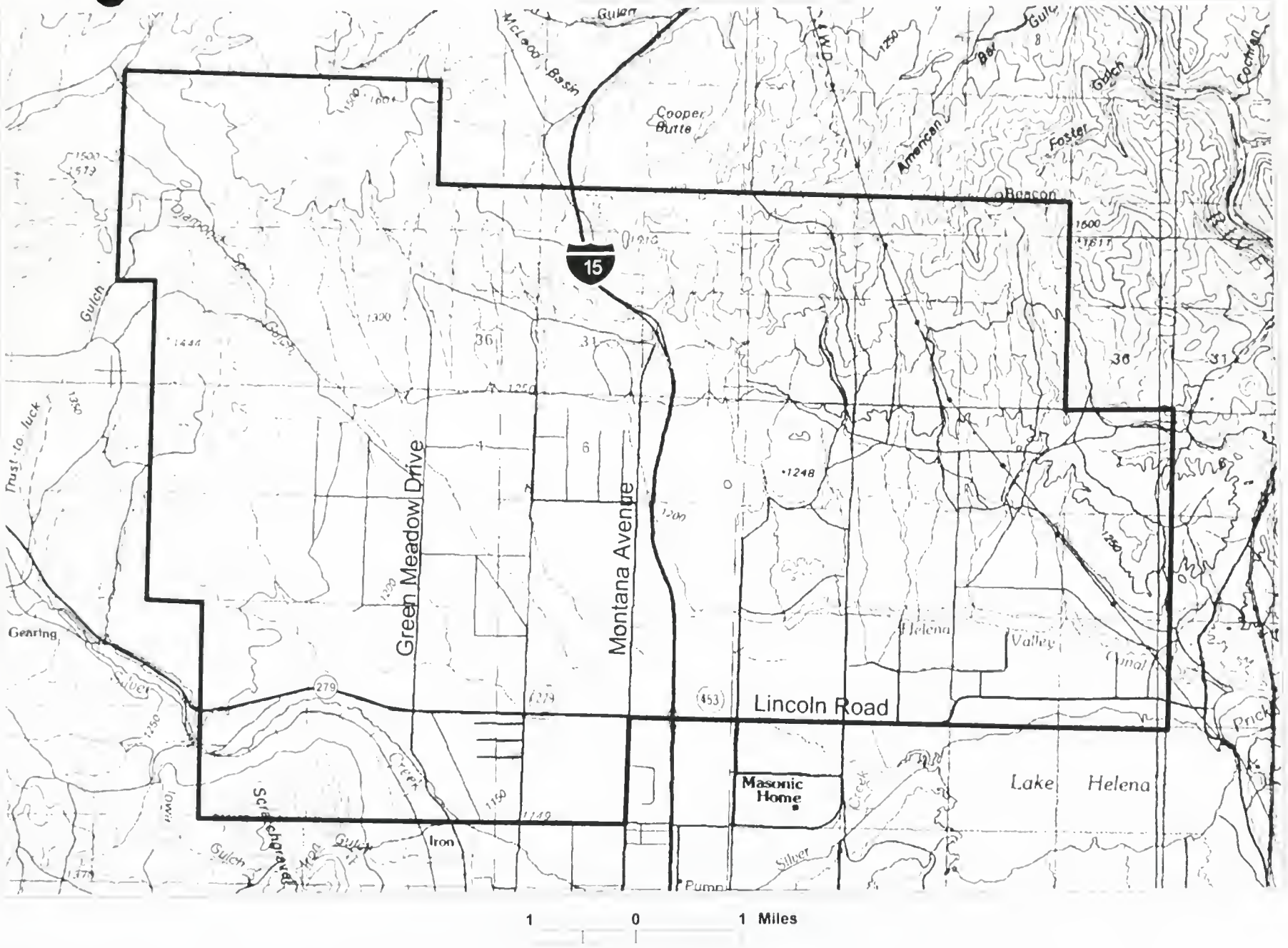
This draft EA has been distributed for public review and comment. Comments will be accepted during a public meeting on Thursday, January 24, 2002, at 7:00 p.m. at the Jim Darcy School, and by mail until January 30, 2002. The draft EA will be revised into a final EA following the close of the public comment period.

1.4 Other Agencies With Related Responsibilities

Other government entities have regulatory and review responsibilities that can have an effect on ground-water development in the area. These entities are:

1) The Montana Department of Environmental Quality: subdivision review, review of community water systems and wastewater treatment systems;

2) Lewis and Clark County: subdivision review, septic permits, Water Quality Protection District.



Map 1. Boundary of the proposed North Hills CGA (background from USGS).

1.5 Decision Process and Contested-Case Hearing Process

DNRC must follow the statutory process and criteria in 85-2-506 through 85-3-508 MCA when reviewing a petition for a CGA. A contested-case hearing on the North Hills CGA petition will be held to gather information and arguments supporting and opposing the petition. The contested-case hearing will be held following the publication of the final EA. The notice of the hearing will be published in the local paper, and be mailed to each area well driller, landowners and ground-water rights holder within the proposed CGA boundaries, local governments, and state and federal agencies. DNRC will receive oral and written testimony relevant to the designation or modification of the proposed North Hills CGA at the contested-case hearing. The procedure will be full, fair and orderly, and all relevant evidence will be received. Because of the technical nature of the statutory criteria, data and expert testimony will be essential to making a case during the process.

After the conclusion of the hearing, DNRC will issue a proposed order with written findings and a proposed decision on the petition. The proposed order will be distributed to parties that participated in the hearing, so that they may have the opportunity to submit exceptions. A final order will be issued following this review of the proposed order and exceptions to it. The final order will contain DNRC's decision on whether or not a controlled ground-water area should be designated. The final order can be appealed to district court.

Chapter 2 – Issues and Alternatives

2.1 Issues

Many issues were brought to DNRC's attention during the public scoping process. Some of the issues, although important, are best addressed during the administrative hearing process, and therefore, will not be discussed in this EA. Listed below by category are a summary of the issues that were raised during the scoping process that will be evaluated in this EA.

Social

1. Is there a need to have a study to evaluate the water supply so we can plan for growth and determine what level of development is sustainable?
2. What are the potential impacts to property rights?

Economic

1. What are the potential economic impacts on existing homeowners, including well replacement costs, of not having a CGA?
2. What are the potential impacts of CGA designation on property values?
3. How will future homeowners be protected from potential economic losses?
4. What are the potential impacts of a declining water table on property values if there is no CGA?
5. What are the potential impacts of a CGA and temporary closure on new residential development?

6. Will there be compensation for potential property rights losses due to CGA designation?
7. What are the potential costs of contesting permit applications?

Need

1. Is there a need for a controlled ground-water area and for a moratorium on new wells?
2. Is there a need for a controlled ground-water area given the existing subdivision requirements of Lewis and Clark County and the Montana DEQ?

Water Supply

1. There is a need to separate drought impacts from those due to human water use.
2. There is a need to collect more data and to evaluate the ability to do a study in 2-to-4 years.
3. Identify where aquifer recharge is coming from, and the travel times and age of recharge water.
4. There is a need to separate the bedrock and alluvial aquifers.
5. There is a need to quantify the thickness of the alluvium over the bedrock.
6. Local aquifer variability needs to be taken into account.
7. The effects of water supplied by the Helena Irrigation District on ground water in the area should be evaluated.
8. The possible recharge of the bedrock aquifer from the Helena Valley alluvial aquifer should be analyzed.
9. Will adding more wells during a study may make the study results unreliable because conditions were not static?
10. The USGS study needs to be reviewed and considered.
11. Define the current level of water use in the proposed CGA.

Water Quality

1. Potential impact to water quality, especially in regards to nitrates, need to be evaluated.
2. What is the action level for nitrates where additional treatment would be required?

Other

1. A weighing and balancing of impacts is needed.
2. Where would DNRC get funding for a ground-water study?
3. Is the water permitting system adequate to address the petitioners concerns?
4. You need to assess the temporary nature of a closure.
5. Where are there new subdivisions being proposed?
6. How can existing users be protected; what is a "call" for water?
7. The possibilities of creating public water and sewer systems should be looked at.
8. How would such a study would mesh with ongoing studies by the Lewis and Clark County Water Quality Protection District?

2.2 Alternatives

The purpose of developing project alternatives is to attempt to resolve issues or potential problems with a proposal. In addition to the *No Action* and *Petition Proposal*, three other alternatives known as the *Modified Permit Alternative*, *Adjusted CGA Boundaries Alternative, and Water Quality Study Alternative* have been developed after considering the major issues raised during scoping. Under all the action alternatives, the controlled ground-water area designation would be temporary: for two years with a possible extension to 4 years.

Alternative 1 – No Action Alternative

Under the *No Action Alternative*, the petition would be denied and there would be no temporary controlled ground-water area in the North Hills. Drilling of wells and development would continue as it has under existing procedures and regulations.

Alternative 2 – Petition Proposal Alternative

This alternative would be the *Petition Proposal* which would require DNRC to:

1) Perform a comprehensive hydrogeologic study of the designated area as needed to characterize and quantify the current and future availability of ground water;
2) In cooperation with the Montana Department of Environmental Quality (DEQ), assess the nature and extent of changes in ground-water quality as a function of current and projected beneficial uses in the proposed North Hills CGA;
3) Close the area to further appropriation of ground water, except for replacement wells, during the term of the study.

Alternative 3 – Study with Modified Permitting Process Alternative

The *Modified Permit Process Alternative* was developed in an attempt to balance the concerns of the petitioners with those who oppose a temporary closure, and to consider study funding concerns. It would include a ground-water supply study as described under Alternative 2, but not a ground-water quality study. It also differs from Alternative 2 because, during the duration of the study, DNRC would not close the area to ground-water appropriation but instead would:

1) Initiate temporary modified water right permitting procedures and require specified ground-water data to be submitted for all new ground water appropriations;
2) Propose water right permitting and ground-water data collection procedures, as part of a temporary controlled ground-water area, to support ongoing evaluation of the availability of ground water, and the potential for adverse impacts to current and future water users.
3) Allow water right holders to object to new water rights for all wells during the two-to-four year period, including those that are less than 35 gpm;
4) Initiate a hydrogeologic study of the designated area as needed to characterize and quantify the availability of ground water for appropriation and the potential for adverse impacts to current water users.

Alternative 4 – Adjusted CGA Boundaries Alternative

The *Adjusted CGA Boundaries Alternative* can be combined with either alternative 2 or 3, but with boundaries modified to only include areas where the primary water source is the pre-

Tertiary age bedrock aquifer (Map 2). Areas where alluvial aquifers are the primary water source would be excluded from the CGA. The excluded areas also are down gradient of the Helena Valley Canal, which may be providing some ground-water recharge. Map 2 depicts the boundaries of the potential CGA under this alternative.

Alternative 5 – Water Quality Study Alternative

The *Water Quality Study Alternative* is the same as the Modified Permit Process Alternative (Alternative 3) with the addition of a provision to initiate a study of the nature and extent of changes in ground-water quality as a function of current and projected beneficial uses. Specifically, the study would focus on the collection and analysis of data on nitrates in ground water. Water quality and potential impacts to water quality at nearby wells would be considered when evaluating new permit applications during the 2-to-4 year period. Water quality review procedures would be developed in cooperation with DEQ.

Chapter 3 – Existing Environment

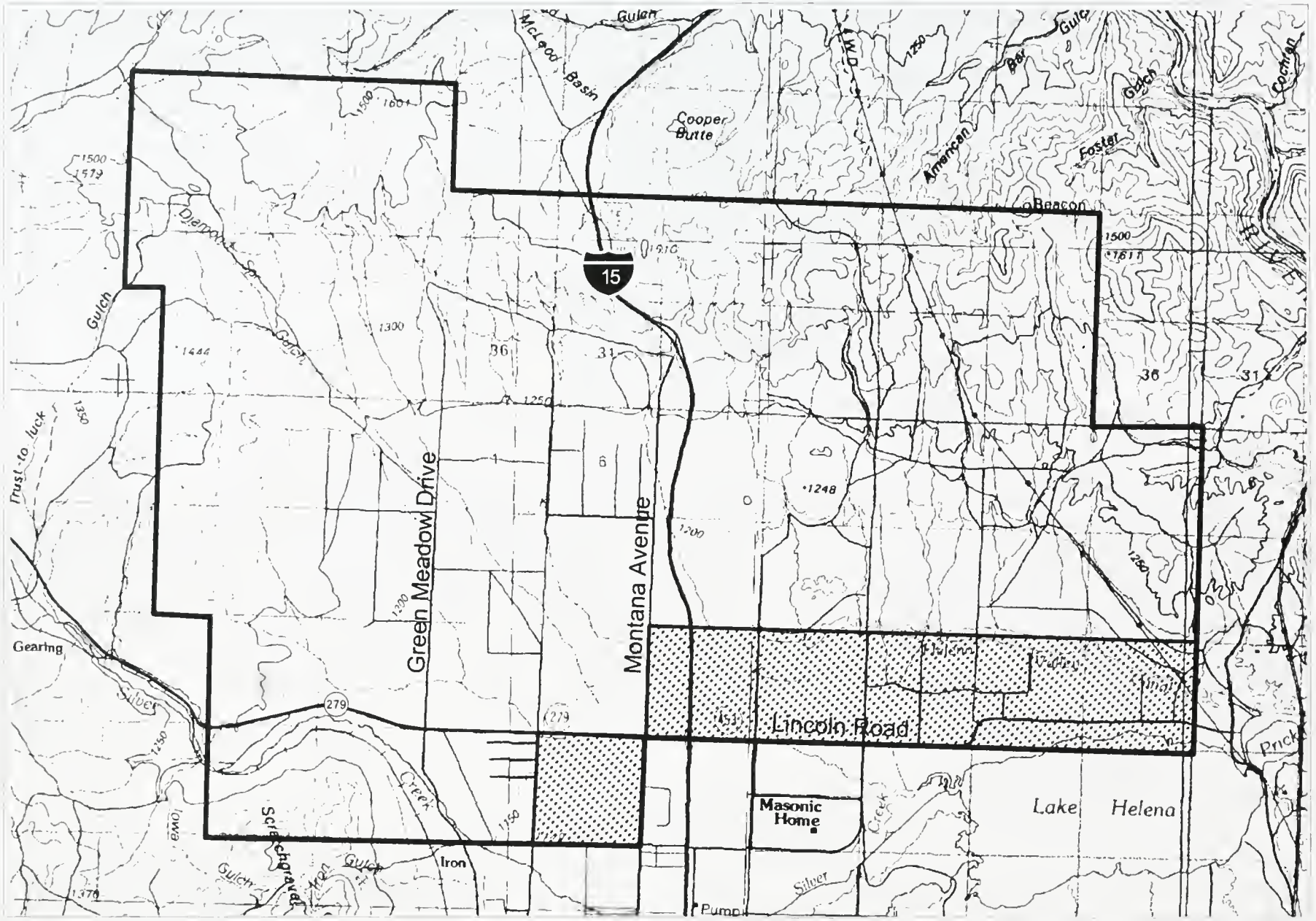
3.1 Ground-Water Resources

Wells in the proposed North Hills CGA obtain water primarily from Precambrian age bedrock of the Spokane and Greyson formations (Thamke, 2000). The Spokane and Greyson formations consist of mostly fine-grained sediments, originally clay and silt with thin layers of sand and limestone, that have been compacted and heated during burial. A number of wells at the south end of the area obtain water from Tertiary age sedimentary rocks and unconsolidated alluvium where these younger rocks overlay Precambrian bedrock. Tertiary age rocks consist of semi-consolidated clay, silt, sand, gravel and volcanic ash deposited in streams and lakes, and alluvium consists of unconsolidated clay, silt, sand and gravel deposits (Briar and Madison, 1992). Map 3 depicts the geology in the proposed CGA.

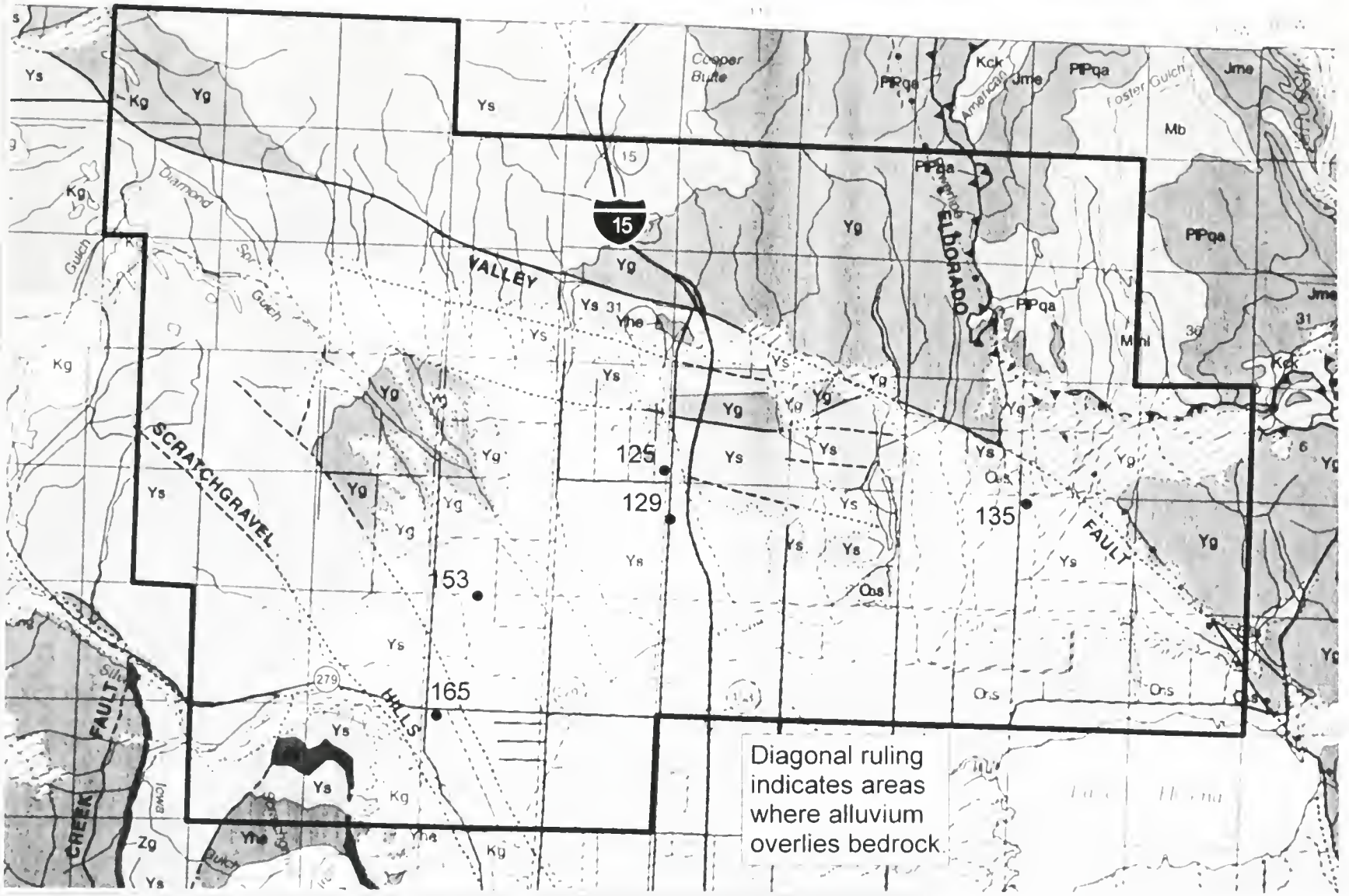
Faulting, fracturing, and folding that occurred during mountain building further modified Precambrian age rocks. The Helena Valley Fault bounds the north edge of the Helena Valley and is the most extensive geologic structure in the proposed North Hills CGA (Thamke, 2000). Numerous other faults have been mapped during various investigations (Schmidt, 1986; Stickney and Bingler, 1981), and countless other faults and fractures have not been mapped because they are obscured or are too small. Because the Precambrian age rocks beneath the North Hills have been compacted and cemented, faults and fractures are the primary paths for water flow. These faults and fractures interconnect to varying degrees and probably form a system of essentially separate aquifers rather than a single continuous aquifer.

Ground water flows through this aquifer system from higher elevations toward the Helena Valley aquifer to the south.

The amount of ground-water development that can be sustained in the North Hills depends on the properties and boundaries of the bedrock aquifer, the pattern and amount of recharge, and the pattern of ground-water development (Bredehoeft et al, 1982). Variable and often unpredictable



Map 2. Alternative CGA boundary (background from USGS).



Map 3. Geology of the proposed Norh Hills CGA (background from USGS).

hydrogeologic conditions within the North Hills, in addition to variable well construction, result in considerable differences in depths and yields of wells, often over relatively short distances (Maps 4 and 5). The combination of these factors needs to be considered in order to assess the potential for future ground-water development.

Aquifer Properties

There is evidence that continuous fault zones may transmit considerable amounts of water locally in the North Hills. However, in other instances, faults or fractures that contain clay or are poorly connected to other fractures may transmit significantly less ground water or act as barriers to ground-water flow. In addition, because fracture openings are the only paths for ground water in the North Hills bedrock, the overall capacity of the rock to store water is highly variable but generally low.

The amount of water that can be transmitted and stored in fractures and faults intersected by a well directly affects well yield, and water level response to pumping and variations in recharge. Over a larger area, the degree that faults intersected by wells are connected to areas of ground-water recharge or discharge affects long-term sustainability of yields and water levels. The volume of water stored in an aquifer affects fluctuations in its water level.

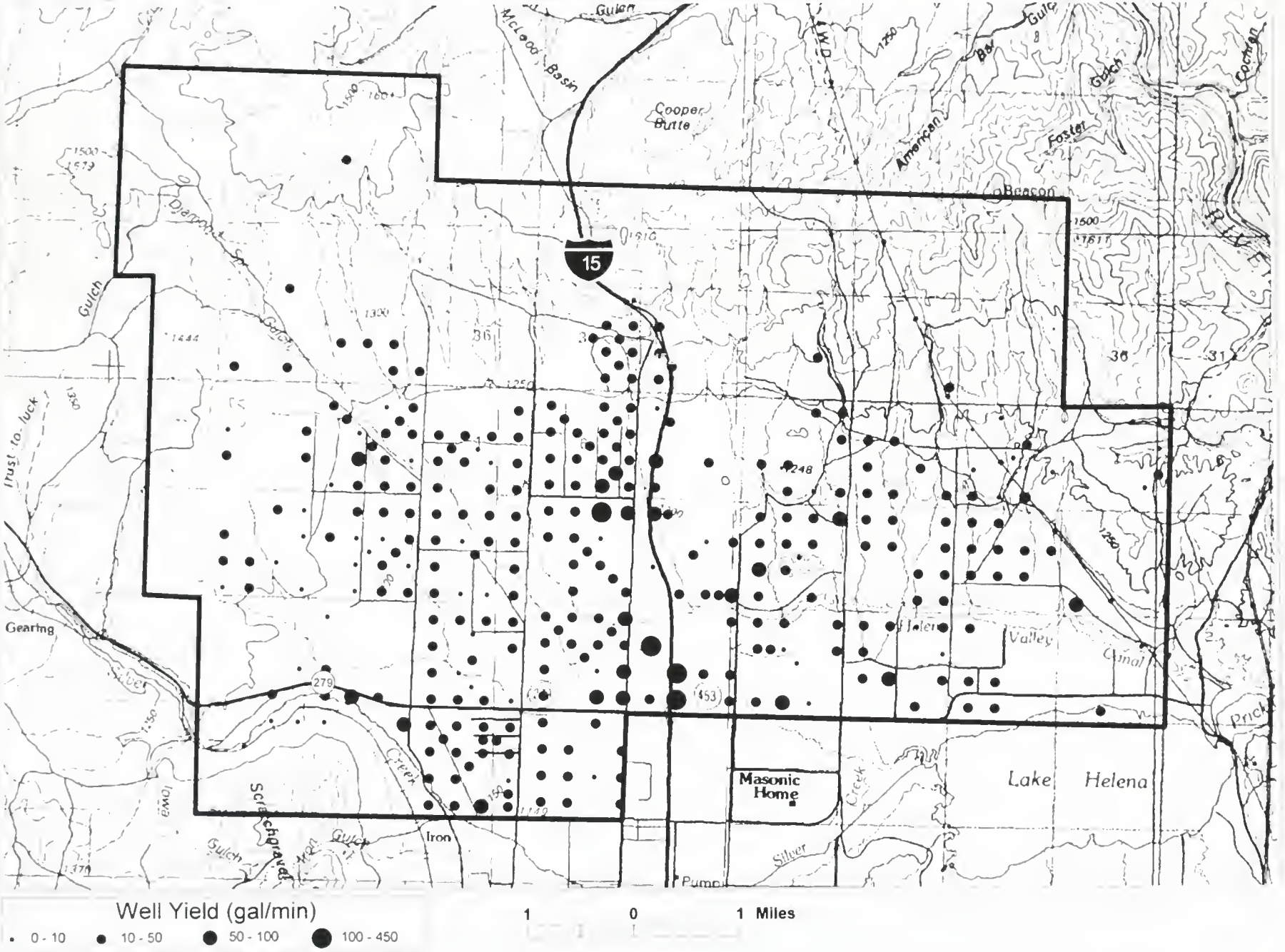
Recharge

Recharge to the North Hills aquifer system varies considerably as a result of seasonal and multi-year cycles of precipitation, variable soil and aquifer properties, vegetation, and terrain. Evaporation and plant needs in the North Hills are large compared to the 14 to 16 inches of average annual precipitation. As a result, water only infiltrates past the root zone during intense storms or snowmelt events, or where water infiltrates from streams (Thamke, 200). Once water moves past the root zone it only reaches ground water after soil moisture depleted during dry periods is replenished. Water may also infiltrate the aquifer through

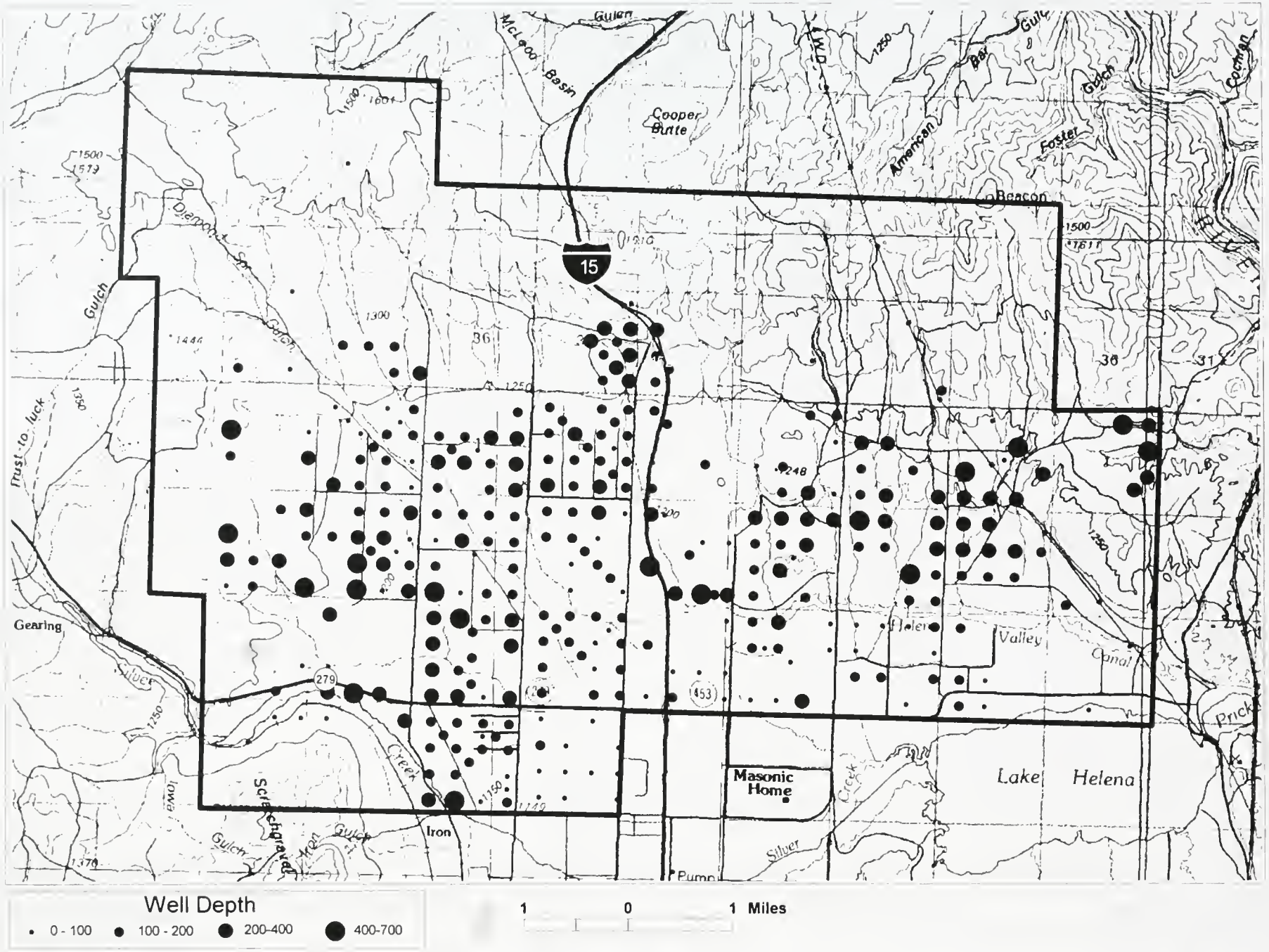
fractures where bedrock is exposed or is near the surface, and has sufficient storage and water transmitting capacity. Ultimately, the bedrock aquifer system beneath the North Hills is probably recharged infrequently in certain areas followed by possibly extended periods when water levels decline as water drains or is withdrawn from storage (Thamke, 200).

Development

Wells always initially draw water from storage in an aquifer, resulting in some amount of water level decline (Theis, 1940). The duration and amount of water level decline from new ground-water development in the North Hills will depend on the aquifer properties described above, the proximity of wells to areas of ground-water recharge and discharge, and the amount and pattern of recharge. The amount of water level decline from pumping also depends on the amount of pumped water that is consumed and the amount that returns to the aquifer. In the North Hills, water used for irrigating lawns, gardens, and crops is probably mostly consumed through evaporation and plant use. In contrast, much of the water used indoors may eventually return to the aquifer through septic systems.



Map 4. Variability of well yields in the proposed Norh Hills CGA (background from USGS and well data from DNRC).



Map 5. Variability of well depths in the proposed North Hills CGA (background from USGS and well data from DNRC).

Sustainability of ground-water development in the North Hills has been addressed in past studies to varying degree. Briar and Madison (1992) estimated total ground-water discharge from bedrock surrounding the Helena Valley as the difference between estimated inflows and outflows calculated from a water balance for the valley-fill sediments. A U.S. Geological Survey (USGS) study conducted from 1993 to 1998 (Thamke, 2000) is the first research study to directly address water resources in the bedrock aquifer system. In the USGS study, water level measurements in 24 wells, water samples from 15 wells, and existing streamflow and precipitation data were used to make general conclusions about water availability in the North Hills. A summary of the findings from these reports are attached in Appendix A.

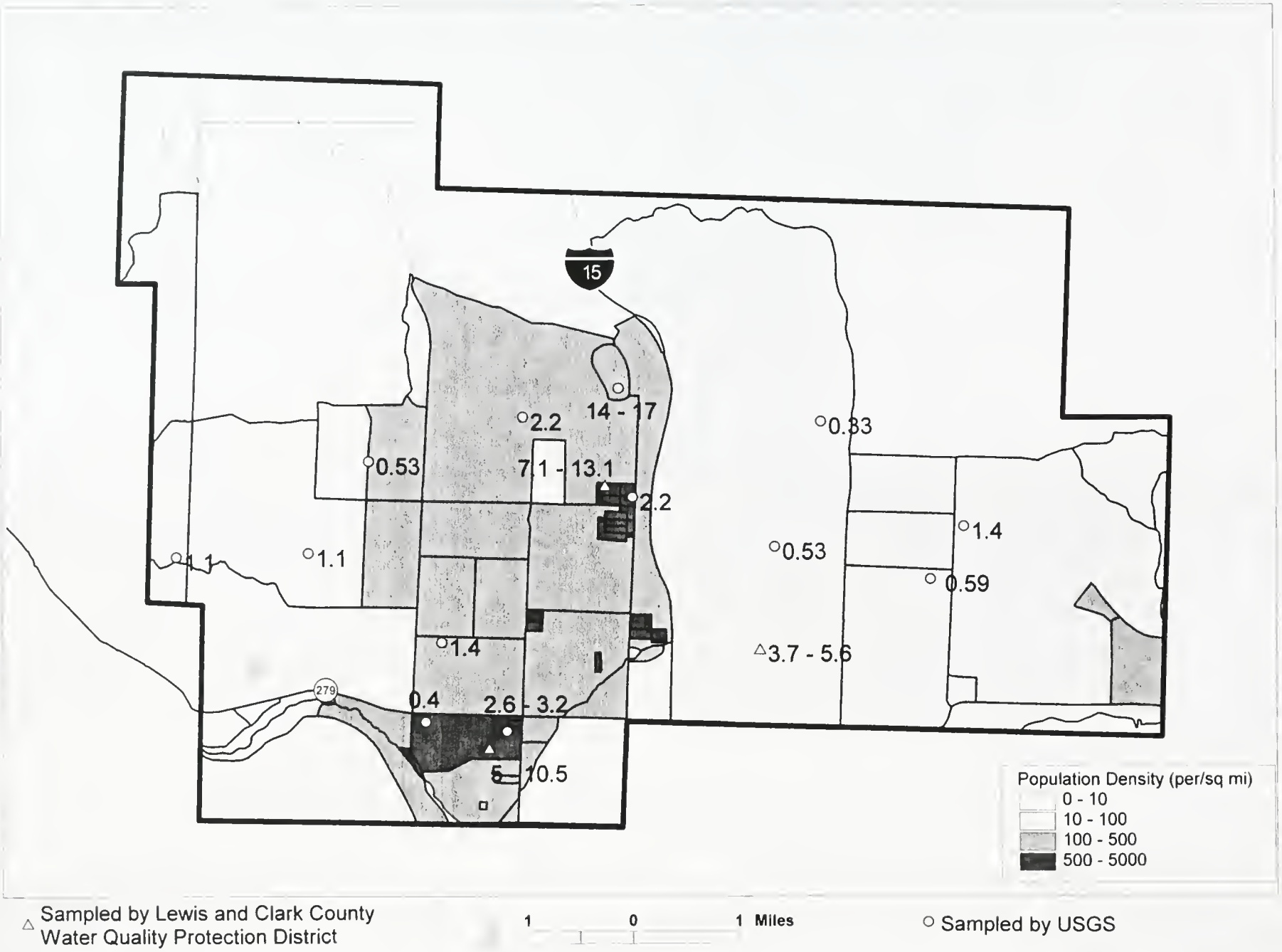
The USGS continues to monitor water levels in six of the wells that were monitored for the Helena Area Bedrock Study (Thamke, 2000). Water levels measured from the early-to-mid 1990s to present for these six wells are presented in Appendix B. Graphs of precipitation data for this time same period are included in Appendix C.

Water Quality

Effluent from septic systems containing nitrates and pathogenic microorganisms can infiltrate ground water and reach water supply wells. Elevated levels of nitrates in drinking water can cause various health effects including a serious illness in infants known as "blue baby syndrome". Microbial contaminants including fecal coliform, E coli, and cryptosporidium may cause gastrointestinal problems that can be particularly serious in infants and people with compromised immune systems. The U.S. Environmental Protection Agency has designated a Maximum Contaminant Level (MCL) of 10 mg/L Nitrate and any occurrence of microbial contaminants as thresholds that must not be exceeded in water from public water systems.

Lewis and Clark County began permitting on-site water treatment systems in 1973 (Lewis and Clark County Plan 2000). Prior to that, on-site wastewater treatment systems were not required to meet any standards. In 1993, the State of Montana adopted minimum standards for on-site wastewater treatment systems that mandated all counties in Montana follow the minimum standards. The amount of nitrate released to the environment from a septic system depends on the composition of the wastewater and the design of the septic tank and drain field. Effluent from a properly functioning septic system contains roughly two to seven times the drinking water limit of 10 mg/L nitrate (Wilhelm et al, 1994). Once released to ground water, the persistence of nitrate and microbial contaminants depends on the physical and chemical conditions in soils and aquifer materials encountered by septic effluent. Dilution and denitrification, a process that uses organic carbon to convert nitrate to nitrogen gas, can lower nitrate concentrations in ground water. Low dispersion and absence of organic carbon in fractured bedrock such as the North Hills aquifer system may limit dilution and denitrification, however (Wilhelm et al, 1994).

Elevated concentrations of nitrates in ground water have been documented in areas of concentrated septic systems, including areas of the Helena Valley (Drake, 1995). Nitrate concentrations in wells in the North Hills are available from the USGS bedrock study (Thamke, 2000) and ongoing sampling by the Lewis and Clark Water Quality Protection District (Map 6). These data indicate concentrations of nitrates greater than the MCL have been detected in three wells and that concentrations may be elevated in other wells.



Map 6. Nitrate concentrations (mg/L) and populaiton density in the proposed North Hills CGA (background from USGS).

3.2 Land Use

Existing land-use in the proposed CGA is low-density housing, a few commercial businesses, farming, and forest and rangeland. A synopsis of the main land uses in the area is represented by the water-rights records. Figure 1 shows total ground-water rights volumes in the proposed CGA area by purpose. The majority of the ground-water rights are for domestic use, and residential lawn and garden use. Agricultural uses for irrigation and stock watering also are significant, and some of the lands in the southern portion of the CGA are irrigated with water from the Helena Valley Canal.

The amount of land in the area that was subdivided for homes increased during the 1990s. Figure 2 shows county subdivision trends from 1986 through 1999. Figure 3 depicts a similar increase in the number of water rights granted, with the low activity during the mid 1980s to early 1990s followed by a noticeable increase starting about 1994.

A portion of the proposed CGA would be in a "Transitional Growth Area" (see Map 7) as defined in the Lewis and Clark County Comprehensive Plan (Lewis and Clark County 2000). Transitional growth areas are designated in the County Plan as areas that are not contiguous to existing urban development, but suitable for urban development over a longer term. Commercial uses are encouraged to locate within these areas, especially in the portions near the intersections of major roads.

Figure 1. Total ground-water rights volumes in the North Hills area by purpose (source: DNRC water-rights data base.

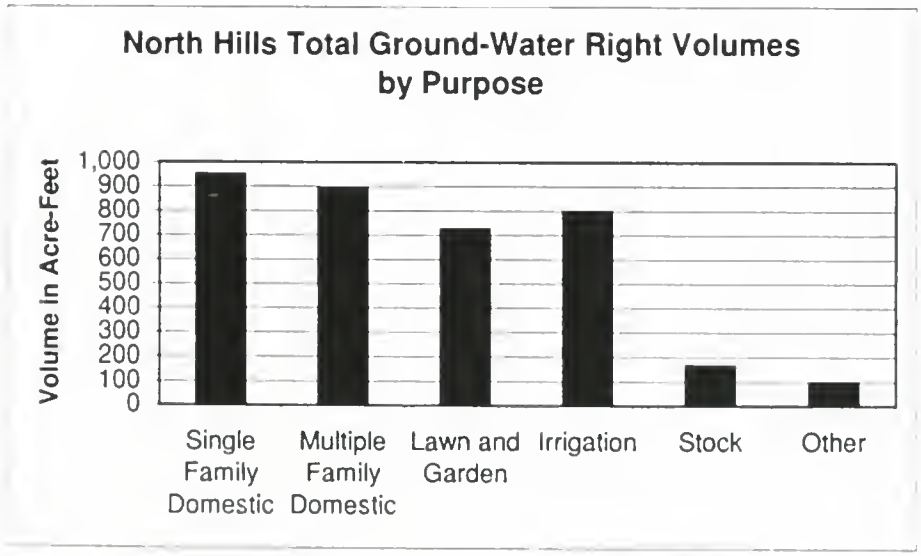


Figure 2. Lots created in Lewis and Clark County by the subdivision review process (source: Lewis and Clark County, undated).

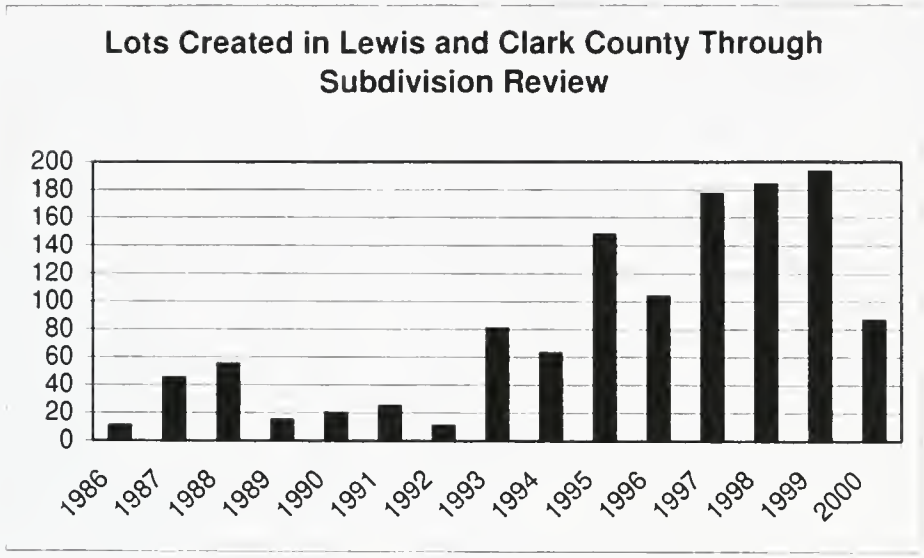
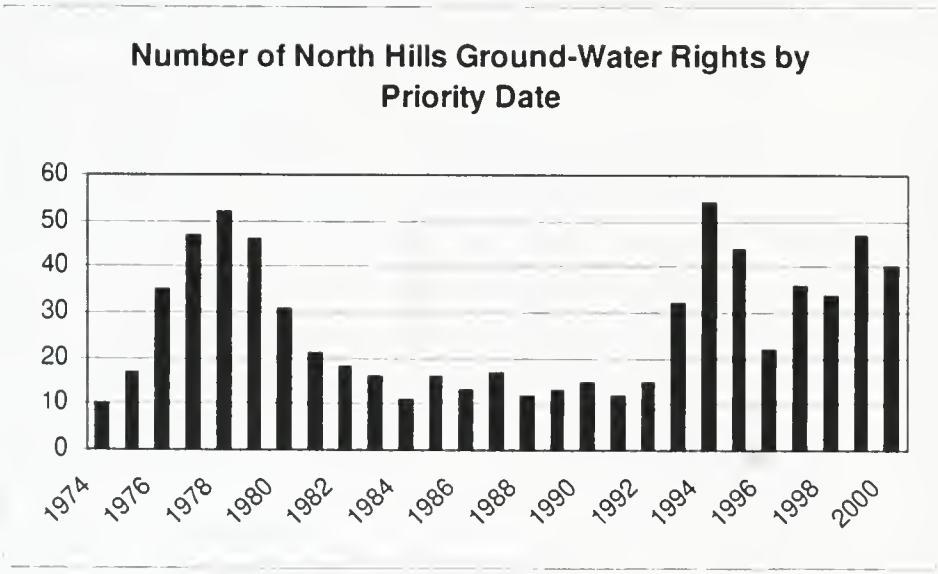
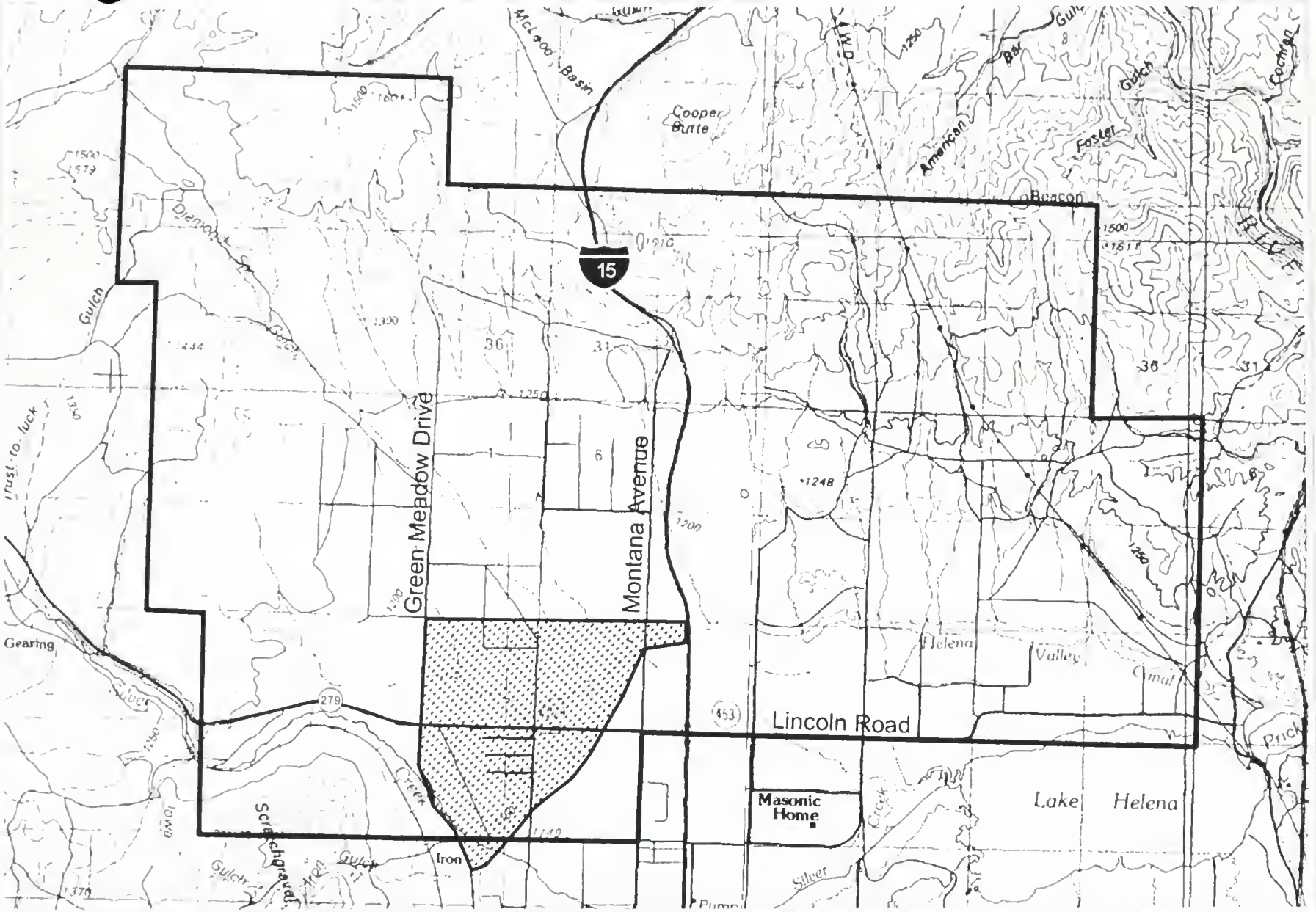


Figure 3. Number of water rights granted in the North Hills area by priority date (source: DNRC water-rights data base).





Map 7. Transitional growth area identified in Lewis and Clark County Comprehensive Plan (background from USGS).

3.3 Demographics

The pertinent demographic data for the Census Designated Places (CDPs) that contain the portions of the proposed controlled ground-water area describe an area growing rapidly in terms of population and number of households (U.S. Department of Commerce, Census Bureau. 2001). The Helena Valley Northeast and Helena Valley Northwest CDPs represent the areas of the Helena Valley north of Lincoln Road; they are separated by Interstate 15. While these CDPs when combined do not conform exactly to the proposed controlled ground-water area, the proposed CGA comprises the majority of the area of the two CDPs. The U.S. Census Bureau began reporting data for these CDPs in the 1990 Census.

Population

Table 1 shows that the population for both the Helena Valley Northeast and Helena Valley Northwest CDPs grew 50 percent between 1990 and 2000. Most of this growth occurred in the Helena Valley Northwest CDP which grew 71.4 percent during the period. The rates of growth in these areas vastly exceeded the rates of population growth for Helena, the rest of the Helena Valley and Lewis and Clark County and the state which saw rates of growth ranging from 4.8 to 17.3 percent.

Table 1. Area population trends--1980-2000.

	1980	1990	2000	Percentage Change 1990-2000
Montana	786,690	799,065	902,195	12.9
Lewis and Clark County	43,039	47,495	55,716	17.3
Helena Valley	38,863	42,883	45,819	10.7
Helena	23,938	24,609	25,780	4.8
Helena Valley NE		1,585	2,122	33.9
Helena Valley NW		1,215	2,082	71.4

As displayed in Table 2, the median age of residents in the area increased during the 1990s as it did in Helena and in the rest of the county and state. In 1990, the median age for the area was significantly lower than the rest of the county and state. By 2000, the median age for the eastern part of the area (39.4) exceeded that for Helena, the county and the state while the median age in the western part of the area remained lower than that for Helena, the county and the state.

Table 2. Median age of area residents—1990-2000.

	1990	2000
Montana	33.8	37.5
Lewis and Clark County	34.0	38.0
Helena	34.9	38.8
Helena Valley NE	28.3	39.4
Helena Valley NW	30.4	35.4

As would be expected in an area of rapid population growth, the number of households--or occupied housing units--also expanded rapidly during the 1990s. Table 3 shows that the number of households in the north Helena Valley increased 65.6 percent between 1990 and 2000, a rate far greater than in Helena and elsewhere in the county and state. The number of households nearly doubled in the northwestern part of the Helena Valley.

Table 3. Area household number trends—1990-2000.

	1990	2000	Percentage Change 1990-2000
Montana	306,163	358,667	17.1
Lewis and Clark County	18,649	22,850	22.5
Helena	10,421	11,541	10.7
Helena Valley NE	537	776	44.5
Helena Valley NW	379	741	95.5

The trend toward smaller households occurred throughout the Helena Valley, Lewis and Clark County, and Montana as displayed in Table 4. Average household sizes in the area in 1990 and 2000 were greater than in the county and state and decreased at a far greater rate (14 percent) during the period. The decrease in household size is consistent with trends reflecting higher median age, smaller family sizes, higher population, and increasing housing density in the area.

Table 4. Household size trends--1990, 2000.

	1990	2000	Percentage Change 1990-2000
Montana	2.53	2.45	-3.2
Lewis and Clark County	2.47	2.38	-3.6
Helena	2.23	2.14	-4.0
Helena Valley NE	3.12	2.68	-14.1
Helena Valley NW	3.25	2.81	-13.5

3.4 Economics

Property Values and Water

The market value of residential property is a function of many factors, both external to and inherent in a particular property. The growth of the surrounding area and the scarcity of land suitable for development as well as the proximity to places of employment, commercial, educational, and recreational sites are factors external to a piece of property that affect its value. Characteristics of property in a location like the North Hills that determine its value can include the presence of trees, the view from the property, the size of the parcel, the availability of owner financing, and access to roads, gas and electricity, and water. A survey of property listings and

sales in the area (derived from advertisements, discussions with local realtors, and sales data from the Multiple Listing Service) reveals a wide range of land prices varying with such characteristics of residential property. Prices range from $2,000 per acre to $35,000 per acre on parcels ranging from 2 acres to 20 acres in size.

The economic value of a parcel of property to a buyer reflects the relative stream of benefits likely to occur from property ownership. A buyer's perception of the likelihood of the occurrence of such a stream of benefits introduces an element of risk into the decision to invest in a parcel of property. For example, in considering an investment in a parcel of property, a buyer may assess the likelihood of the continuation of a strong trend in local growth or the development of a premium golf course on an adjacent parcel. To the extent that he assumes that such developments are likely, the buyer speculates on the value of the property under consideration.

Similarly, a buyer will consider the relative likelihood of a property's access to water in deciding whether to invest in that property. Access to potable water is more likely in hydrogeologically favorable locations and on properties with seniority in the water rights regime. Ultimately, a buyer increases the likelihood of accessing water through establishing a properly engineered well in a productive aquifer or obtaining water right seniority through which he can call junior water right holders or propose a controlled ground-water area. The effective exercise of senior water rights can protect senior water right holders from diminution of their rightful water use by junior water right holders. Each of these means of ensuring more reliable access to water entails potentially significant cost. In a properly functioning market, property values should reflect the perceived risk associated with the uncertainty regarding the availability of water for a particular property.

Chapter 4 – Potential Impacts of the Alternatives

4.1 Ground-Water Resources

Alternative 1 - No Action Alternative

Under the No Action Alternative, ground water development will proceed under existing procedures and regulations. The number of domestic and stock watering wells will increase and additional larger production wells may be permitted based on possibly incomplete information on water availability and the potential for impacts to existing well owners. New wells might impact water levels of existing wells if the additional withdrawals cannot be sustained, and well owners may need to lower their pumps or deepen their wells. Longer term, water may need to be brought from outside the North Hills in a worst case of extreme overdraft of the North Hills aquifer.

Alternative 2 - Petition Proposal Alternative

Under the Petition Proposal Alternative, ground-water development will be limited to replacement wells for the duration of the proposed hydrogeologic study. No additional wells will be drilled while the hydrogeologic study is being conducted, and impacts on water levels of existing wells will be limited to that caused by existing development.

Alternative 3 - Study with Modified Permitting Process Alternative

Under the Modified Permitting Process Alternative, domestic and stock watering wells will be permitted under a modified process and applications for larger production wells will proceed under existing procedures and regulations. Additional wells will be permitted during the hydrogeologic study and, as a result, there will be greater ground-water withdrawals while the hydrogeologic study is proceeding than under Alternative 2. However, information will be collected from each new well to help improve the understanding of water availability and the potential for adverse impacts to existing wells, resulting a greater chance that sufficient information will be obtained to evaluate the need for a permanent CGA. Additional wells will change the ground-water conditions being studied to some degree, however the study will not be compromised because ground-water conditions are always changing.

Wells will not be sampled to assess the nature and extent of nitrate contamination as specified under Alternative 2 and 5. As a result, areas where beneficial uses are impaired by elevated nitrate concentrations will not be detected.

Alternative 4 - Adjusted CGA Boundaries Alternative

Under the Adjusted CGA Boundaries Alternative, ground water development will proceed under existing procedures and regulations in the sections omitted from the CGA. The impacts described for Alternative 1 may be experienced in the sections omitted from the area included in Alternative 2 and possibly in adjacent areas inside the adjusted CGA boundaries.

Alternative 5 - Water Quality Study Alternative

Under the Water Quality Study Alternative, water samples will be collected from all new wells and analyzed for nitrate. Impacts will be the same as described under Alternative 3 except that the nature and extent of nitrate contamination will be evaluated to determine whether beneficial uses are impaired.

4.2 Land Use

Alternative 1 - No Action Alternative

Under this alternative, existing land-use trends in the CGA would continue. Homes with wells would be constructed in existing subdivisions, and new subdivisions would be created in a similar way as they are now.

Alternative 2 - Petition Proposal Alternative

Under this alternative, land-use changes from agricultural and rangeland to residential development in the CGA would be substantially reduced in the short-term (2-to-4 years) because access to ground water would be restricted. Some new home construction probably would occur on those lots where wells were drilled and water rights secured prior to the temporary CGA closure. Because of the restrictions in place in the CGA, builders may seek to construct new homes elsewhere. Hence, the temporary moratorium on ground-water permitting in the CGA could result in an indirect impact of increased well drilling and home construction in areas outside of the CGA boundaries.

Alternative 3 - Study with Modified Permitting Process Alternative

Under this alternative, new development of land for residential use would continue where ground water is found to be available for appropriation and where new pumping would not have an adverse affects to existing water users. In locations where there is less available ground water, or where impacts to existing users are more likely, access to water would be restricted and residential development would be reduced.

Alternative 4 - Adjusted CGA Boundaries Alternative

Impacts under this alternative would be similar to those discussed under Alternatives 2 and 3 for areas within the CGA. For areas that have been excluded from the CGA, impacts would be similar to those described under Alternative 1.

Alternative 5 - Water Quality Study Alternative

Impacts under this alternative would be similar to those described under Alternative 3, except that some new development may be restricted where potential water quality problems are found.

Property Rights

The water in the ground belongs to the state, and a water right gives a person the legal right to take water and use it beneficially. A water right allows the holder to use water when it is legally and physically available; it does not guarantee that the water will be there all of the time.

In Montana the value of land is often a function of available water and access to it. Because a temporary closure on new water-well drilling would restrict access to ground water, the *Petition Proposal Alternative* could be construed by some as temporarily precluding development opportunities. If this alternative were chosen, it is possible that some landowners could contest a temporary closure and pursue compensation for alleged losses in property value, but this type of question would need to be resolved by the courts.

4.3 Demographics

Alternative 1 - No Action Alternative

Demographic trends would proceed as they would have absent the proposal over the next two to four years.

Alternative 2 - Petition Proposal Alternative

A moratorium on ground-water development will curtail growth in the area. To the extent that growth and demand for housing in the Helena area continues during the moratorium, the growth that would have occurred in the area would occur elsewhere.

Alternative 3 - Study with Modified Permitting Process Alternative

Growth in the area would be reduced to the extent that development is discouraged by a more rigorous permitting process.

Alternative 4 - Adjusted CGA Boundary Alternative

As development proceeds in areas omitted from the proposed controlled ground-water area, demographic trends are likely to continue as they would absent the proposal. Areas remaining within the boundary would be affected as described in the Alternative 2 discussion.

Alternative 5 - Water Quality Study Alternative
Growth in the area would be reduced to the extent that development is discouraged by a more rigorous permitting process.

4.4 Economics

Alternative 1 - No Action Alternative
Existing well owners would continue to incur costs imposed by additional well development over the next two to four years. Such costs include replacing and deepening wells and costs associated with contesting ground-water permits. At drilling costs of $18 of per foot, replacing a well can cost up to $4,000. In a worst case scenario, water might need to be hauled in from outside of the area or provided through the development of a community water system. Such prospects are likely to diminish the value of homes and property in the area. The continued uncertainty regarding the status of ground water in the area tends to weight downward the economic value of properties with access to abundant, reliable water.

Alternative 2 - Petition Proposal Alternative
Because new wells would not be allowed, current well owners would incur fewer costs from impacts that would occur under the No Action Alternative assuming that the decrease in ground-water levels is due to the increase in pumping. They may have less need to replace and deepen wells and object to new permits.

Those property owners with reliable access to water whose development might not impact existing wells would have increased difficulty developing or selling property during the moratorium. The prospect of no new wells under a potential controlled ground-water area will negatively impact the value of their property during the two- to four-year period. The study of water availability in the area, however, may demonstrate that these properties have access to water without negatively impacting existing wells. Such a study would reduce uncertainty over access to water for themselves and potential buyers of their property. This reduction in uncertainty regarding the status of their properties' access to water may increase the value of their property.

Those property owners whose property is found to have limited physical and legal access to water will also have difficulty developing or selling their property during the two- to four-year period. However, it is not likely that they or subsequent buyers could have developed their properties without substantial cost to themselves or imposing costs on existing well owners. The proposed study may bear this out and this information is likely to reduce the uncertainty regarding the properties' access to water. The status of water availability--both physical and legal--described in the study will probably be reflected in the properties' market values.

Alternative 3 - Study with Modified Permitting Process Alternative

The costs borne by affected well owners described in Alternative 1 would continue under this alternative although to a lesser extent due to probable fewer applications and a lengthier permitting process and less development.

While the costs borne by property owners due to the moratorium described in Alternative 2 would not occur in this alternative, they would incur additional costs related to the more rigorous permitting process. These property owners would still be affected by the uncertainty cast by the prospect of a controlled ground-water area, however.

The benefits of better information described in Alternative 2 would occur under this alternative.

Alternative 4 - Adjusted CGA Boundary Alternative

For the omitted areas.

Existing well owners would continue to incur costs imposed by additional well development over the next two to four years. Such costs include replacing and deepening wells and costs associated with contesting ground-water permits. At drilling costs of $18 of per foot, replacing a well can cost up to $4,000. In a worst case scenario, water might need to be hauled in from outside of the area or provided through the development of a community water system. Such prospects are likely to diminish the value of homes and property in the area. The continued uncertainty regarding the status of ground water in the area tends to weight downward the economic value of properties with access to abundant, reliable water.

For areas still included in CGA boundaries.

Because new wells would not be allowed, current well owners would incur fewer costs from impacts that would occur under the No Action Alternative assuming that the decrease in ground-water levels is due to the increase in pumping. They may have less need to replace and deepen wells and object to new permits.

Those property owners with reliable access to water whose development might not impact existing wells would have increased difficulty developing or selling property during the moratorium. The prospect of no new wells under a potential controlled ground-water area will negatively impact the value of their property during the two- to four-year period. The study of water availability in the area, however, may demonstrate that these properties have access to water without negatively impacting existing wells. Such a study would reduce uncertainty over access to water for themselves and potential buyers of their property. This reduction in uncertainty regarding the status of their properties' access to water may increase the value of their property.

Those property owners whose property is found to have limited physical and legal access to water will also have difficulty developing or selling their property during the two- to four-year period. However, it is not likely that they or subsequent buyers could have developed their properties without substantial cost to themselves or imposing costs on existing well owners. The proposed study may bear this out and this information is likely to reduce the uncertainty

regarding the properties' access to water. The status of water availability--both physical and legal--described in the study will probably be reflected in the properties' market values.

Alternative 5 - Water Quality Study Alternative
The costs borne by affected well owners described in Alternative 1 would continue under this alternative although to a lesser extent due to probable fewer applications and a lengthier permitting process and less development.

While the costs borne by property owners due to the moratorium described in Alternative 2 would not occur in this alternative, they would incur additional costs related to the more rigorous permitting process, including those related to water quality. These property owners would still be affected by the uncertainty cast by the prospect of a controlled ground-water area, however.

The benefits of better information described in Alternative 2 would occur under this alternative.

Chapter 5 – Need and Evaluation Criteria

5.1 Need

During the public scoping process, some questioned the need for a controlled ground-water area by making the case that existing regulations and permit requirements provide adequate protection to the prior water users. Are existing water rights and subdivision requirements sufficient to protect existing ground-water users from potential adverse affects to water quantity and quality?

All ground-water use requires a water right and DNRC administers water rights. Larger new wells (those greater than 35 gallons per minute (gpm) and using 10 acre-feet or more per year) require a water right that only can be obtained through the permitting process. That process requires the applicant to pay a $200 fee, and to provide a preponderance of evidence to demonstrate that water is physically and legally available, and that the new use will not adversely affect the rights of existing well owners. In addition, other water right holders have the opportunity to object to issuance of the new water right (for a $25 fee), or recommend conditions to prevent adverse effects. Failure by the applicant to prove the above criteria would allow DNRC to deny the new water right. For smaller new wells (less than 35 gpm) outside of controlled ground-water areas, DNRC has no authority to deny a water right if the paperwork is properly completed and the $25 fee is paid.

In the North Hills, the majority of water rights on file are for wells that pump less than 35 gpm, although larger wells account for a substantial portion of the total permitted volume (see Table 5). Some existing users are frustrated because they can not contest the smaller well permits. At the public scoping meeting, others countered that senior water users are protected because they can place a "call" for water when they believe that pumping by junior users is harming them.

Table 5. Wells in the proposed CGA that are less than 35 gallons per minute compared to those that are greater than 36 gpm (source: DNRC water-rights data base).

	Total Filed	Total Rate in gpm	Total volume in acre-feet
0-to-35 gpm	764	12,756	1,809
36 gpm and greater	32	3,395	1,160

Water rights have an associated priority date, which is the date the right was filed and in general, first in time is first in right. If a water right holder believes that pumping by other junior water users are unreasonably affecting their ability to obtain water, the senior user can "make call" on those junior users. That means personally contacting the junior right-holders face-to-face, by phone, or by letter, explaining the situation, and requesting that they shut off or reduce their use. If the junior user refuses, the senior user can file a complaint with DNRC as the first step, and DNRC may investigate the situation and make a report or recommendation. Generally, however, water rights are treated as private property, and as such it is up to the owner to enforce their own rights through the courts if DNRC cannot resolve the dispute through voluntary compliance. Seeking the court's assistance will require proof that the water shortage problems are being caused by junior water users. And this may require that the senior user hire a professional water resources consultant, as well as an attorney. Of course, this can be costly, and sometimes it may be cheaper for the senior user to deepen the well, if water is available deeper, or to drill a new one. Or the senior user could seek reimbursement for lawsuit costs. In summary, ground-water rights enforcement is a difficult and often expensive procedure.

The need for a controlled ground-water area also was questioned because some believe that the subdivision rules of DEQ and Lewis and Clark County require review that is adequate to protect the prior water user.

The Montana Department of Environmental Quality (DEQ) is responsible for reviewing public water supply systems and public wastewater treatment systems for subdivisions. For public water systems that are supplied by wells, DEQ usually requires the developer to pump-test the well for 24-hours at a rate of 1.5 times the proposed capacity of the system to demonstrate that water is available. For proposed new subdivisions in the North Hills that do not include a public water system, since the summer of 2001 DEQ has required developers to submit some data to demonstrate that ground water is likely to be available for the subdivision (Regensburger 2001). Minor subdivision proposals of one-to-five parcels are reviewed by Lewis and Clark County under contract with DEQ. In all cases, DEQ and the county require data only to determine whether there is likely to be enough water for the proposed developments: not to analyze potential impacts to prior water users.

The subdivision review process is only required for new subdivisions, and not for land that has already been subdivided. An analysis by the Lewis and Clark Water Quality District (Moore 2001) found that there are at least 3,461 undeveloped lots that already have been subdivided and have yet to be developed. For comparison, there are about 800 existing wells with water rights in the North Hills.

In regards to water quality protection, Lewis and Clark County administers a septic permitting system to insure that domestic sewage is properly disposed of and treated to protect surface and ground-water supplies. The Lewis and Clark Water Quality Protection District was created in 1992 with the mission to preserve, protect, and improve water quality within the district boundaries. To fulfill its mission, the District has the following objectives:

1. Characterize the nature and extent of District water resources;
2. Response to citizens' concerns about water quality problems;
3. Educate the public about local water issues;
4. Facilitate planning for the prudent use of our municipal watersheds; and
5. Develop and implement water quality protection plans.

The district includes all of Lewis and Clark County. Its operations are funded by an annual levy on homes and businesses within the District boundaries. The District monitors 3 wells in the proposed CGA consistently for nitrates and periodically for static water levels, and additional wells sporadically for nitrates. The District also monitors static water levels quarterly for two other Montana Bureau of Mines and Geology monitoring wells in the proposed CGA.

The possibility of developing community water systems to import water to problem areas in the North Hills was suggested during the scoping process as an alternative to CGA designation. Developing community water systems would require funding for the infrastructure, and importing water would necessitate some creative technical and administrative methods. Potential water sources for such systems could be the Helena Valley Canal, or ground water from the Helena Valley Alluvial Aquifer. There are no existing proposals to use these sources, but their potentials are discussed briefly in the paragraphs that follow.

Using water from the Helena Valley Canal would require a water service contract with the U.S. Bureau of Reclamation, which pumps stored water into the canal from Canyon Ferry Reservoir, and concurrence of the Helena Valley Irrigation District. Presently, the canal is only operated during the summer irrigation season, while domestic water users would need a year-round supply. Operating the canal and reservoir during the winter would cause logistical problems, such as icing, which may be difficult and expensive to solve. This surface water also would require treatment to meet drinking-water standards.

Piping water into the North Hills from ground-water production wells in the Helena Valley alluvium to the south may be the best potential alternative water supply source for the area. The alluvial aquifer in the valley is generally considered to be a better water supply than the surrounding bedrock aquifers, although there are limitations to this source. High-yield community water system wells in the Helena Valley alluvium would need to be approved through the water rights permitting system, and it is possible that permit applications for such wells would be contested by nearby existing ground-water users.

DNRC's Ability to do a Study

The petitioners have requested that DNRC, with the assistance of DEQ, study the quality and quantity of the ground-water resources of the North Hills. During the scoping process, some questioned whether the agencies would have the resources, both staff and financial, to do the study. The agencies do not have any funding in their current budgets for this type of study. If it

was decided that a temporary controlled ground-water area and study were needed, the agencies and proponents for a controlled ground-water area would need to seek funding and staff support. Possible funding sources may be:

- U.S. Environmental Protection Agency (EPA), Regional Geographic Initiative Grants, Program funding cap: $30,000;

- DNRC Conservation District 223 program: Funding of up to $10,000 but would have to be applied for through the Lewis and Clark County Conservation District;

- DNRC Watershed Planning Assistance: for implementation of watershed planning activities, up to $10,000;

- DNRC Renewable Resource Grants: For projects that conserve, manage, develop, or protect Montana's natural resources. Grants of up to $100,000. Proposals must be sponsored by a governmental agency.

Staffing for a study would be another concern, because the state agencies do not have extra staff to work specifically on a North Hills ground-water study. Reviewing all new water right applications that are less than 35 gpm as suggested in the *Modified Permit Process Alternative,* would be difficult for the DNRC Helena Regional Office too. The Lewis and Clark County Water Quality District may be able to participate in a study by providing some staff assistance. Other possibilities would be to have much of the data collection for a study done by students, or to have a graduate student work on a study as a thesis project.

Under the *Modified Permit Process Alternative* and the *Water Quality Study Alternative* applicants who wished to develop new wells would have to submit ground-water data during the permit-review process. Because of this, the agencies would be able to use these data in a study, but the cost of the data collection would be paid for by the applicant.

5.2 Evaluation Criteria

The controlled ground-water area statutory criteria, information available from past studies, and additional information which could be collected during a future study are described in this section.

A. *Ground-water withdrawals are in excess of recharge to the aquifer or aquifers within such ground-water area.*

A long period of precipitation and stream flows records, and data on potential evaporation and plant use, and soil and bedrock properties are necessary to understand the dynamic role of recharge in sustaining ground-water development. The study of the Hydrology of the Helena Area Bedrock (Thamke, 2000) developed a general understanding of these factors; however, this study covered 585 square-miles and, as a result, the information obtained specifically on the North Hills is not sufficiently detailed to evaluate long-term recharge. In contrast, studies conducted for subdivision projects contain more detailed information on specific sites but do not

describe the role of recharge in determining sustainability of ground-water development in the North Hills as a whole.

A prospective study could be designed to define the nature and distribution of recharge better and to identify site-specific data that need to be collected to evaluate applications for new water appropriations.

B. *That excessive ground-water withdrawals are very likely to occur in the near future because of consistent and significant increases in withdrawals from within the ground-water area.*

Whether future ground-water withdrawals will be excessive depends on factors that are not well understood: the extent and pattern of future ground-water development, and changes in recharge to and discharge from the aquifer. A detailed understanding of aquifer boundaries, and the geometry and properties of fractures that transmit water are needed to evaluate the response of the aquifer system to future development. Past researchers have mapped fractures and described the history of geologic development of the North Hills, information that is necessary to describe the geometry of the aquifer system.

Descriptions of rock properties and water production during drilling of new wells, and water-level drawdown data from pumping tests could be used during a prospective study to characterize aquifer properties. In addition, water chemistry data could be used to evaluate ground-water flow patterns.

C. *That significant disputes regarding priority of rights, amounts of ground water in use by appropriators, or priority of type of use are in progress within the ground-water area.*

There have been numerous objections to proposed subdivisions on the basis of water availability and the potential for adverse impacts to water levels and yields of nearby wells. A focus of many of the objections has been methods of aquifer testing, and interpretation of aquifer test results. In addition, disputes regarding water rights currently are addressed on a case-by-case basis and cumulative effects generally are not considered

An objective of a prospective study could be to develop standard testing and analysis methods for evaluating cumulative effects of new water appropriations.

D. *That ground-water levels or pressures in the area in question are declining or have declined excessively.*

Water levels analyzed for 12 wells by the U.S.G.S. for the period January 1992 through May 1998 do not indicate an overall declining trend (Thamke, 2000). However, hydrographs from 6 wells monitored by the U.S.G.S. and reports of 30 dry wells in the North Hills indicate water levels have declined from 1998 through 2000, apparently as a result of a period of below-average precipitation (see Appendixes B and C).

A longer period of monitoring and an improved understanding of aquifer conditions is needed to understand the response of water levels to climatic conditions and changes in ground-water development.

E. *That excessive ground-water withdrawals would cause contaminant migration.*

Water samples from wells in the proposed CGA indicate elevated nitrate concentrations in areas of concentrated older septic systems. No studies have identified a direct causal connection between excessive ground-water withdrawals and nitrate concentrations, however.

Sampling of water from new wells, repeat sampling of wells sampled previously, and data reported for public water system wells can be used to identify spatial and temporal trends that may be related to ground-water withdrawals.

F. *That ground-water withdrawals adversely affecting ground-water quality within the ground-water area are occurring or are likely to occur.*

There is evidence of elevated nitrate levels in ground water within the proposed CGA boundaries, but no indication that ground-water withdrawals are causing migration of contaminants.

Again, wells can be sampled to identify trends that may be related to ground-water withdrawals.

G. *That water quality within the ground water area is not suited for a specific beneficial use.*

Nitrate concentrations in 15 samples analyzed by the U.S.G.S. between 1994 and 1998 ranged from 0.05 to 17 mg/L. In one well nitrate concentrations have been sampled that are higher than the maximum contaminant level (MCL) of 10 mg/L set by EPA for public water supplies (Thamke, 2000). There are insufficient data to clearly demonstrate that nitrate levels are increasing; however, studies in the Helena Valley Aquifer and other areas demonstrate the potential for increased nitrate concentrations in ground water in areas served by septic systems.

Future sampling would provide a better understanding of the prevalence and causes of elevated nitrate in ground water in the North Hills

Chapter 6 – References

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Chapter 7 - List Of Preparers

Tim Bryggman -	Demographics and Economics
Larry Dolan -	Project Coordination and Land Use
Russell Levens -	Ground-water Quantity and Quality

Appendix A: Summary of previous reports that contain information on the ground-water resources of the North Hills area.

Table 1. Summary of hydrologic studies conducted in the vicinity of the proposed North Hills CGA.

Title: Hydrology of Helena Area Bedrock, West-Central Montana, 1993-1998 (Thamke, 2000).

Objective: To assess the hydrology of the Helena area bedrock and to provide information that can be used to evaluate future changes in the hydrologic system.

Data Collection (specific to North Hills): Inventory of 36 water wells, monthly measurements of water levels in 24 wells, and collection of water-quality samples from 15 wells.

Conclusions:

- Average precipitation in the North Hills ranges from 10 to 16 inches and provides limited recharge to bedrock during times of favorable precipitation and soil moisture conditions.
- Perennial streams in the North Hills are mainly areas of discharge.
- Ephemeral or intermittent streams likely provide some recharge during times of runoff.
- Recharge from the Helena Valley irrigation canal and applied irrigation water is limited to the southern foot of the North Hills; the overall recharge from these sources to the North Hills bedrock probably is small.
- Yields from 36 wells in the North Hills bedrock ranged from 6 to 100 gal/min, with a median yield of 20 gal/min.
- Water levels analyzed for 12 wells for the period January 1992 through May 1998 indicated a decreasing trend for 2 wells, an increasing trend for 2 wells, and no trend for 8 wells.
- Nitrate concentrations measured in water samples from 15 wells ranged from less than 0.05 to 17 mg/L. Water from one well had nitrate concentrations greater than 10 mg/L; the likely source of the high nitrate in water from the well is human or animal waste.
- Availability of water in Helena area bedrock differs areally across short distances as a result of precipitation, evapotranspiration, and the heterogeneous character of the rock types and joint, fracture, and fault systems in the many different geologic units.
- Water levels in wells fluctuate in response to natural and human-induced recharge and discharge.

Title: Hydrogeology of the Helena Valley-Fill Aquifer System, West-Central Montana (Briar and Madison, 1992)

Objective: To describe the hydrogeology of the valley-fill aquifer system.

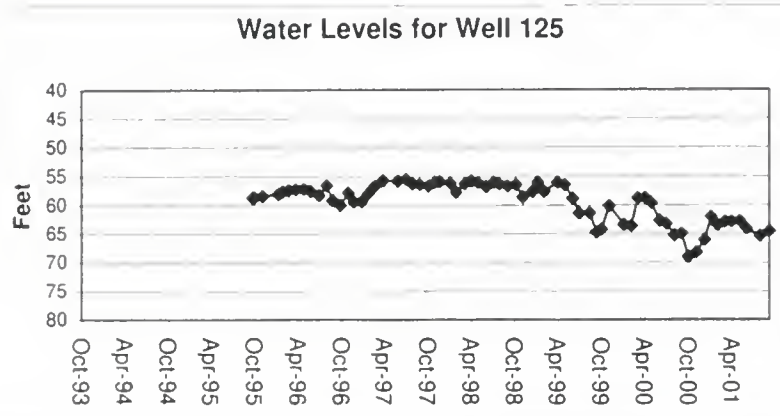
Data Collection (all in valley-fill sediments): Inventory of 1,400 wells and drilling of 23 test holes. Completion of seven aquifer tests, measurement of water levels in 84 wells, and measurement of water quality in 93 wells. Measurement of streamflows continuously at three sites and periodically at 14 sites.

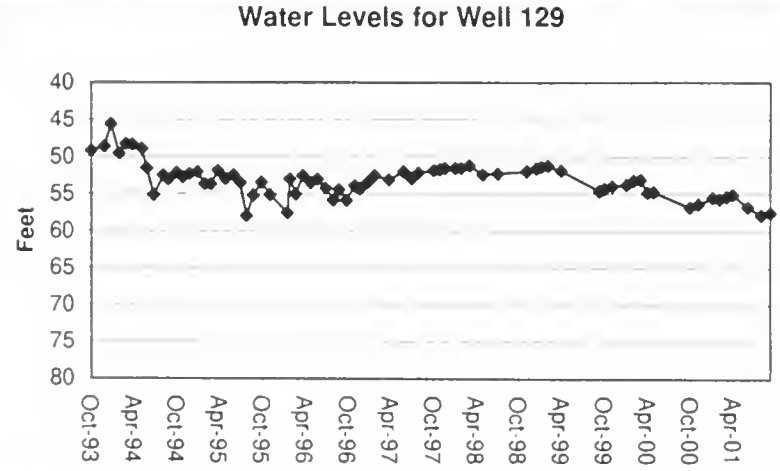
Conclusions:

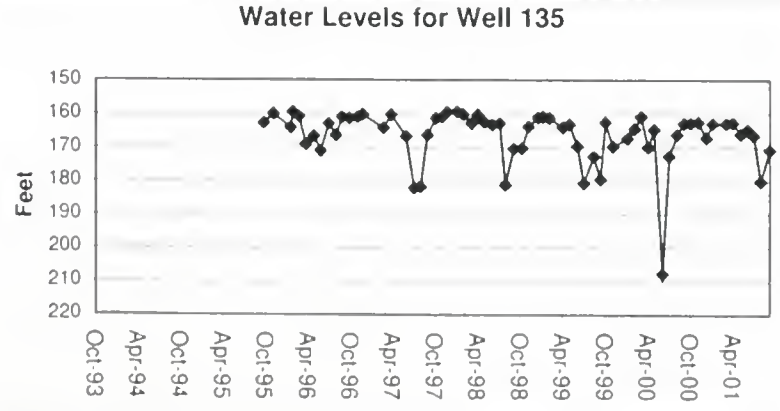
- Recharge to the Helena valley-fill aquifer system is through infiltration of streamflow (12,900 acre-ft/yr), leakage from irrigation canals (7,060 acre-ft/yr), infiltration of excess water applied to irrigated fields (27,000 acre-ft/yr), and inflow from fractures in the surrounding bedrock (39,800 acre-ft/yr).
- Evaporation and transpiration from non-irrigated parts of the valley exceed precipitation; therefore, recharge from precipitation occurs only in response to infrequent periods of sustained precipitation or as part of excess water applied to irrigated fields.
- Despite an apparently anomalous distribution of nitrate in the valley-fill aquifer system, some degree of correlation seems to exist between areas having the largest concentration of nitrate in water samples and areas having the largest density of private septic systems.

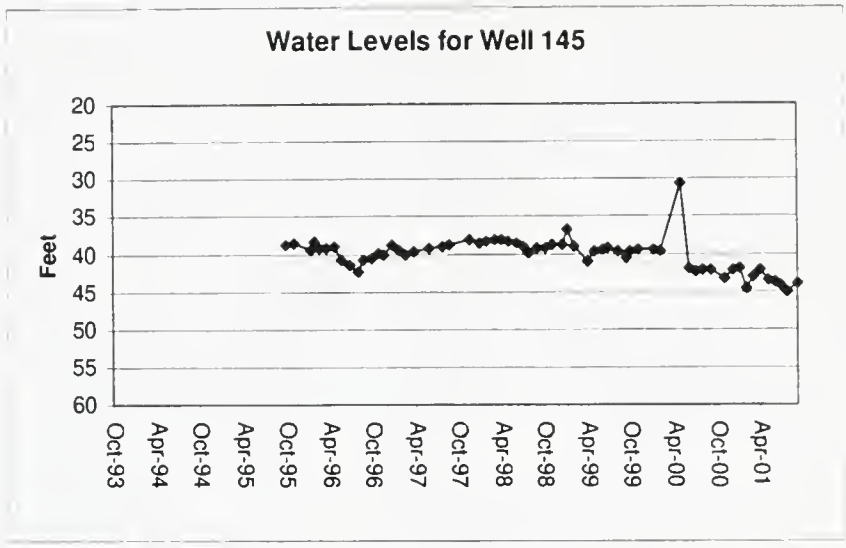
Appendix B: Water levels for wells that are still monitored by the USGS in the North Hills Area.

(Source: USGS unpublished data 2001)





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Feet
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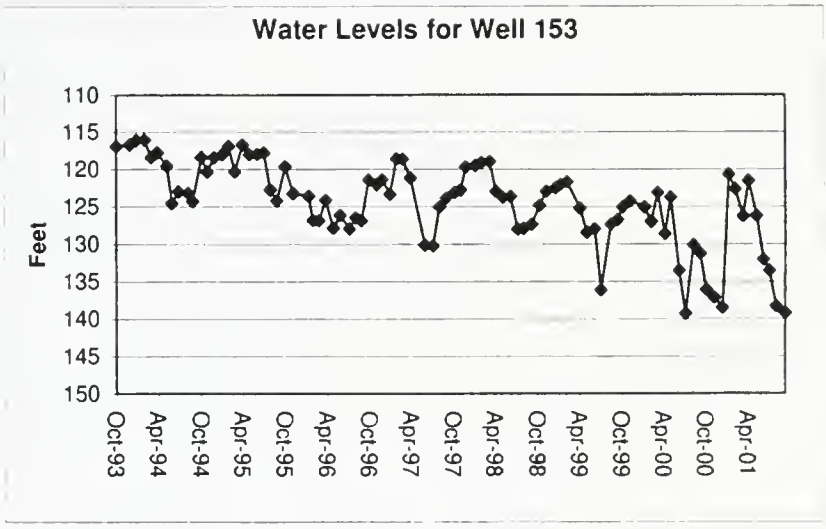
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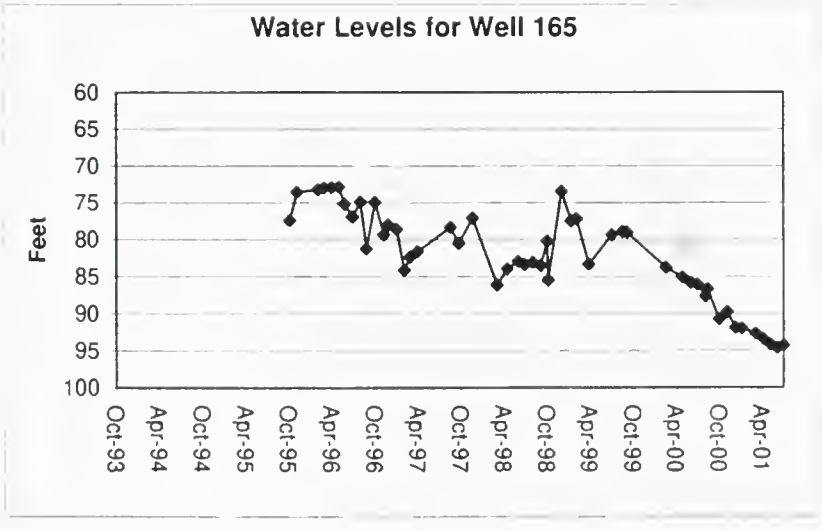
Water Levels for Well 165
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Apr-96
Oct-96
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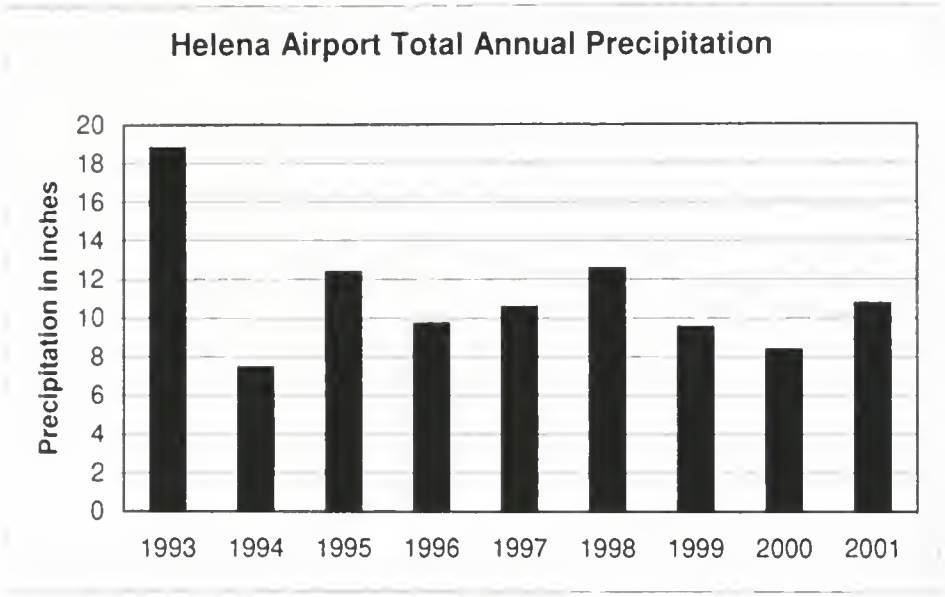
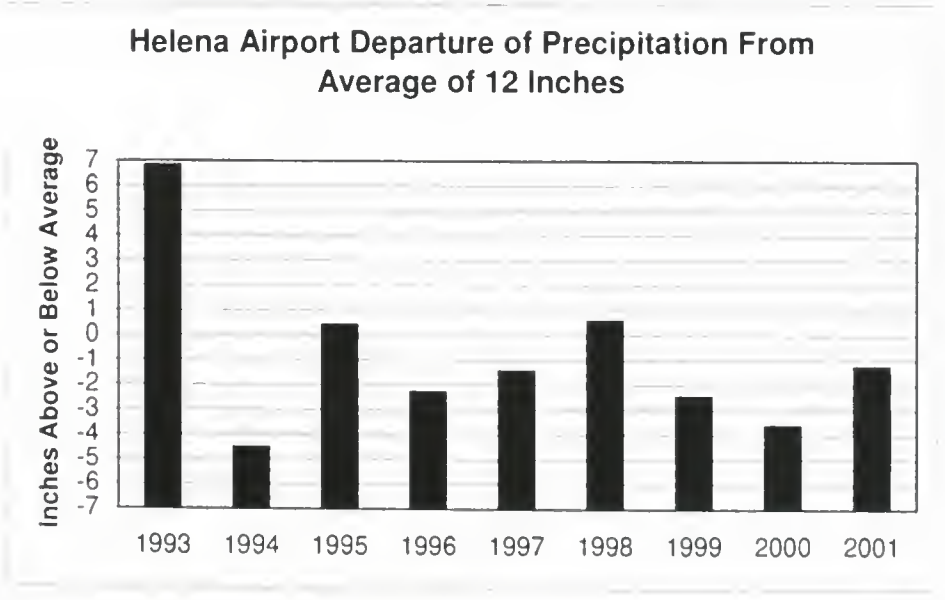
Appendix C: Precipitation data summaries for Helena Regional Airport.

(Source: National Weather Service data)





Appendix D: Copy of controlled ground-water area petition

Form No. 630 R5/97

PETITION FOR CONTROLLED GROUNDWATER AREA
to the Department of Natural Resources and Conservation

NOTICE

This form can be filed by a state or local public health agency for identified public health risks or by at least 25% or 20 of the users of groundwater, whichever is less, in an area for designation of a controlled groundwater area or modification of an existing controlled groundwater area. An incomplete or nonqualifying petition will be returned.

A fee of $200 must accompany this petition. Petitioners must also pay reasonable costs of giving notice, holding the hearing, conducting investigations, and making records pursuant to Mont. Code Ann. §§ 85-2-506 and 85-2-507.

For Department Use Only

Fee Received $200.00

Check No. 1411

No.

(type of print in ink)

RECEIVED
JUL 02 2001
DNRC - HRO

CONTACT PERSON

Name: Vivian M. Drake Phone No.: 406-458-9288

Mailing Address: 75 W. Lincoln Road City: Helena State: MT ZIP: 59602-9420

1. *Mont. Code Ann. § 85-2-506 requires that this petition must allege certain facts showing that one or more of the following situations exist or are likely to occur. Check the appropriate box or boxes and fully explain the alleged facts in the space provided or on additional attached sheets. Attach all supporting information.*

☑ A. ***That groundwater withdrawals are in excess of recharge to the aquifer or aquifers within such groundwater area. Explanation:*** Currently available information suggests that groundwater may already be overallocated in the proposed North Hills Controlled Groundwater Area (CGA). Recharge from precipitation has not been accurately determined, but we know that annual evapotranspiration exceeds precipitation over the proposed area. Figure 2 in Thamke and Reynolds[1], shows average annual precipitation in the North Hills to be between 10 and 16 inches, which is less than the average annual evapotranspiration (estimated 20 to 30 inches) for the area. The report states "as a result, most bedrock areas of the North Hills receive only small amounts of recharge, if any in most years." There are no agency-operated precipitation or evapotranspiration measurement sites located in the North Hills. Since precipitation measurement sites for the Helena area are located in the south and southwestern parts of the area, the USGS precipitation isopleths are inferred from data gathered at locations exhibiting significantly different meteorology than that of the proposed CGA.

Topographic maps (see Section 3) and photographs (Attachment 1) show a relatively small recharge area (the forested portion of the North Hills believed to be the precipitation catchment area) serving a large number of wells (1001) that currently enjoy groundwater allocations of ten acre-feet per annum or more. Thus, current groundwater allocations exceed 10,000 acre-feet per annum (1001 x 10 acre/feet/water right), and the recharge area (upper 10 sections) of the CGA gets only about 7,500 acre-feet per year (14 inches over 6400 acres) of total precipitation. Although this rough calculation ignores the effects of runoff, soil moisture deficit, and evapotranspiration, it shows that there already may be significant overallocation of groundwater in the proposed CGA. An accurate mass balance of recharge versus discharge should be completed before any additional wells are drilled and/or water rights are allocated in the proposed CGA. The DNRC needs to determine if groundwater is available for future withdrawals without causing further damage to current water users.

In addition, chlorofluorocarbon age-dating performed by the USGS shows North Hills groundwater to be between 20 and 37 years old. This does not account for mixing of younger and older waters in the typical domestic well. This indicates that withdrawals are not supplied by recent or concurrent recharge, nor are present drought conditions the sole cause for observed declining water levels.

☑ B. ***That excessive groundwater withdrawals are very likely to occur in the near future because of consistent and significant increases in withdrawals from within the groundwater area. Explanation***: The proposed North Hills CGA is being rapidly subdivided. Subdivisions ranging in size from 2 to 145 lots are being proposed, approved, and "built" without adequate review by the Lewis and Clark County Commission and Montana Department of Environmental Quality (MDEQ) to ensure future groundwater availability and to prevent deterioration of groundwater quality. In only a small number of cases have hydrologic investigations been performed to assess impacts to the bedrock fracture water system and existing water users. A small number of aquifer and pump tests have been performed by local engineers and hydrologists on behalf of developers and subdividers. In some cases, parties having a direct financial interest in the project performed tests and provided information to the regulating agencies. These reports have undergone review and analysis by agency personnel (Lewis and Clark County Water Quality Protection District (WQPD), Lewis and Clark County Planning staff, and MDEQ). Comparison of the results and conclusions of these reports and subsequent agency reviews provides conflicting assessments of groundwater availability in the proposed CGA

A detailed review and analysis of all tests, reports, and reviews performed in the North Hills CGA should be performed to obtain the necessary background to design a comprehensive study of the area to correctly and conclusively determine groundwater availability. A list of available reports known to Petitioners is provided in Attachment 2 and can be reviewed at the Lewis and Clark City-County Planning Offices (316 N. Park, Helena). Additional North Hills subdivision files are available at the Planning Department and should also be reviewed for hydrogeologic information. (Copy costs for

these reports at this time are prohibitive. Petitioners suggest a review of these reports as part of the proposed study and will assist in obtaining the reports if a study is ordered.)

According to the 2000 Census (website http //www census gov), the northwest area of the Helena Valley has seen a population increase of 71.36% in the past decade. A significant part of this increase is in the proposed CGA portion of the North Hills. Graph 1 depicts the average depth of wells by section (in the western portion of the proposed CGA area) since the 1950's. The depth to reach available groundwater is increasing over time. In section T11NR03W, Section 11, some of the deepest wells (>400 feet) are producing the lowest yields (3-8 gpm). A closer examination of the CGA well logs, dry well locations, and water levels should also be part of a comprehensive study of water availability in the North Hills CGA.

☑ C. ***That significant disputes regarding priority of rights, amounts of groundwater in use by appropriators, or priority of type of use are in progress within the groundwater area. Explanation***: A Water Use Complaint, resulting from a "Call for Water" after an owner's well went dry, was filed with DNRC June 14, 2000, by a well owner with water right 82942. The complaint was filed after a large irrigation well was put into production prior to application and issuance of a water right permit. In addition, 3 wells owned by an agricultural user within approximately a quarter mile went dry after the irrigation well went into production. The owner of the dry wells subsequently drilled a 500' dry well and a 500' well with 5-gpm production rate. Although the affected owner did not file a formal complaint with DNRC, costs to this senior water rights holder were significant. (Information regarding details of this incident is available upon request. They are not provided here to protect the privacy of the well owner.)

Additionally, downgradient users (within approximately one mile) were not notified of the irrigation well installation, the permit application, or irrigation well usage in 1999 and 2000. Review of Hydrograph T11NR04WS24BBAB01 (Attachment 3) shows a steady decline in static water level measurements since 1995, with a marked change in negative slope beginning in mid-1999. Five wells located downgradient from the irrigation well went dry during May and June, 2001, and had to be replaced, including the above referenced well. Continued operation of this irrigation well and its permit approval are still under dispute. A detailed review of the pump test, its relationship to the geology of the area, impacts to Silver Creek, and subsequent impacts to users within the North Hills CGA should be performed as part of the study requested in this petition.

Four wells on Griffin Road, T11NR04WS24AA, went dry and were redrilled during the spring of 2001. Applegate Estates (Greenway Major Subdivision) installed 2 public water supply wells in 1996 and performed a limited pump test of those wells during July 1996. Several adjacent homeowners protested the subdivision, in part, based on water availability. A review of this pump test and the attendant water rights permit should also be performed as part of the requested study in order to evaluate potential impacts to the existing wells on Griffin Road.

Many subdivisions have been protested by homeowners in the North Hills area during the past decade. Protests have listed water availability and potential water contamination as major issues to be addressed. A list of aquifer and pump tests performed to satisfy requirements of several subdivision applications are included in Attachment 2. A review of these tests should be included as part of the requested study. Additionally, as wells continue to go dry in the North Hills, "Calls for Water" and resultant disputes can be expected to occur. These disputes will place a significant additional burden on DNRC staff. Petitioners believe the hydrogeology and water productivity of the North Hills bedrock water system and groundwater availability are not adequately characterized. A comprehensive study, as requested by Petitioners, will benefit DNRC by providing scientific information needed to settle groundwater priority disputes. This information will also benefit local government and state agencies in executing their responsibility to ensure water availability for future development and groundwater quality protection.

☑ D. ***That groundwater levels or pressures in the area in question are declining of have declined excessively. Explanation:*** In Thamke and Reynolds Report, Table 2a, entitled "Geologic and inferred hydrologic characteristics of Helena area bedrock, Spokane and Greyson Formations", the author writes under the heading "Protracted Withdrawal of Ground Water": **Slow to moderate drawdown; can be rapid where unit is strongly fractured; overall water-level decline likely on a secular basis with protracted withdrawal; withdrawal can induce precipitation of iron oxides and some carbonate; slow recovery after withdrawal**". These conditions are exhibited by wells in the proposed CGA. Review of hydrographs in Attachment 3, as well as those provided in the USGS Report, show that groundwater levels in the proposed North Hills CGA are declining. The unfortunate result is that well owners are being harmed by having to lower pumps or drill new wells, without any certainty that water is available at depth.

Dr. Mitchell Reynolds, Regional Geologist, USGS-Denver, provides a detailed review of Township 11 North, Range 04 West, Section 14, Lone Mountain 2 Minor Subdivision (see Attachment 2). He cites secular decline of four wells within a mile radius of the subdivision. He also notes that "The geographic and geohydrologic location of the site suggest that it is vulnerable or more vulnerable to depletion of groundwater compared to adjacent sections."

A review of wells logs in the North Hills shows that the majority of wells in the proposed CGA are completed in fractured bedrock composed of Spokane and Greyson shales. These are very competent geologic formations, with groundwater flowing in faults, fractures, and weathered portions of the bedrock. As wells are drilled deeper into the formation, the bedrock is more competent, less fractured, and is therefore less productive.

The Lewis and Clark County Water Quality Protection District currently maintains a database of dry wells and wells exhibiting lower productivity or problems (Attachment 4). A map of these wells, as reported by the end of June 2001, is also included in Attachment 4 and may be accessed on the Internet website: <http://www.co.lewis-clark.mt.us/gis/assets/>. Many of these wells are located in the proposed North Hills

CGA. It is also likely that those reported to date represent fewer than one-fourth of problem wells in the Helena area. In addition, although Montana well drillers are required by ARM 36.21.679(2) to report dry holes, Montana Bureau of Mines and Geology (MBMG) well records do not clearly indicate dry and non-productive wells. This makes it difficult to determine the geographic areas where declining groundwater levels are occurring. A close review of MBMG well records is suggested for the study.

☑ E. ***That excessive groundwater withdrawals would cause contaminant migration. Explanation***: In Table 2a. of Thamke and Reynolds entitled "Geologic and inferred hydrologic characteristics of Helena area bedrock, Spokane and Greyson Formations", the author writes "Interconnected fractures can serve as conduits for unimpeded contaminant flow; fractures and intergranular pore space can be reduced or sealed by accumulation of particulate waste".

Both EPA and MDEQ require that Public Water Supply (PWS) systems (wells) be sampled annually for nitrate, an EPA regulated drinking water contaminant. Ten (10) mg/l is the Maximum Contaminant Level (MCL) for nitrate; i.e. the highest level of a contaminant that is allowed in drinking water. At 5 mg/l nitrate, MDEQ requires a PWS to sample quarterly. Graph 2 depicts the North Hills PWS nitrate concentrations as they are recorded in the MDEQ chemical database. During the past 3 years, significant increases in the nitrate concentrations in several of the PWS wells have occurred. Both Ranchview and Skyview subdivisions have been required to begin quarterly sampling. Given the well locations (downgradient from developed areas), there is a strong likelihood that septic system effluent from upgradient septic systems and other anthropogenic activities, such as animal confinements with manure accumulation and lawn fertilization, are causing groundwater contamination of the bedrock groundwater.

In addition, the Lewis and Clark County Environmental Division received June, 2001, a subdivision application for the area located in T11NR04WS24ADD and DAA, east of Applegate, south of Lincoln Road. Laboratory analysis of nitrate samples collected from at least one well within one mile of the proposed subdivision is required as part of the subdivision review process. Nitrate concentrations from samples collected in this area are 0.12, 0.65, 0.9, 1.11, 6.7, 9, 9.09, and 10.4 mg/l. These data provide a conflicting picture of water quality within a relatively small area, but show clear evidence of contaminant presence and migration in the bedrock system. However, the interface between bedrock and the Helena Valley alluvial aquifer is unclear in this area and should be determined to establish contaminant migration flowpaths and hydrogeologic controls on contaminant transport and fate.

☑ F. ***That groundwater withdrawals adversely affecting groundwater quality within the groundwater area are occurring or are likely to occur. Explanation***: Nitrate data collected over the past decade shows a slow increase in the nitrate concentrations in this area of the North Hills. This information is being included in a peer-reviewed journal article for publication in late 2001. Nitrate concentration isopleth figures from 1975 and 2000 are included as Attachment 5. The isopleths clearly show increases in the nitrate concentrations in the proposed North Hills CGA. Groundwater contamination is

very likely to increase in the North Hills area as growth continues and may result in the inability of residents to safely use groundwater for domestic drinking water. Increased withdrawals from wells in the fractured shales and granites in the proposed CGA will most likely contribute to contaminant migration through the fractured system. In conjunction with water availability, the flowpaths of contaminant migration in the North Hills CGA should also be investigated.

2. **Type of Designation or Provisions Requested:** ***Describe the kind of corrective controls or provisions you are requesting the designation of a controlled groundwater area to include:***

On July 23, 2000, the Helena ***Independent Record*** published a "Your Turn" column entitled "**DNRC not doing job**" that expressed several concerns regarding water rights protection, written by Petitioner Vivian Drake. In an *Independent Record* "Your Turn" entitled "**DNRC responds to complaints**" and letter dated August 10, 2000, Jack Stults, Water Resources Division Administrator, responded to Ms. Drake's concerns by presenting the option of a petition to DNRC for creation of a controlled groundwater area. That DNRC recommendation, together with dry well information gathered by the Lewis and Clark County Water Quality Protection District, comprise the primary impetus for this petition.

North Hills Controlled Groundwater Area Petitioners are requesting that DNRC perform a comprehensive hydrogeologic study of the designated area as needed to characterize and quantify the current and future availability of groundwater. Petitioners also request that DNRC, in cooperation with the Montana Department of Environmental Quality, assess the nature and extent of changes in groundwater quality as a function of current and projected beneficial uses in the proposed North Hills CGA.

To protect existing water rights and prevent further harm to existing water users and water right holders in the North Hills CGA, Petitioners are requesting closure of the area to further appropriation of groundwater, except for replacement wells, during the term of the study.

Petitioners believe that the requested North Hills CGA and supporting study fall entirely within the purviews and missions of the Montana DNRC "*To help ensure Montana's land and water resources provide benefits for present and future generations*", its Water Resources Division "*To providing the most benefit, through the best use, of the State's water resources for the people of Montana*", and its Water Rights Bureau "*To assure the orderly appropriation and beneficial use of Montana's* ***scarce*** *waters*".

Petitioners believe that the requested study is necessary for DNRC to fulfill these missions for the North Hills area. Petitioners also anticipate that the majority of study tasks and costs will be correctly and properly funded by the agency. Petitioners have limited resources and many have already been financially compromised by the need to replace their domestic water supplies, in addition to the lost investment of dry wells.

Consequently, Petitioners cannot bear the financial burden for the extensive and detailed investigations and analyses likely to be needed to support the proposed North Hills CGA. In addition to the scientific information provided as part of this petition (at Petitioners' expense), Petitioners will cooperate with the DNRC in efforts to seek and obtain grant or other private or public funding to support the requested North Hills CGA study. Petitioners also request the right to review any proposed DNRC action requiring non-agency funding in relation to North Hills CGA study.

3. **Map**: ***A U.S. Geological Survey quadrangle map, or one of similar size, scale, and detail level must accompany the petition. In addition to the information provided on the USGS map, the map must also show the following:***

   A. north direction;
   B. township and range numbers;
   C. section corners and numbers;
   D. accurate outline of the proposed controlled area;
   E. location of any known groundwater recording equipment;
   F. point of diversion of all groundwater users, including wells and developed springs.

A 28" x 36" map comprised of the USGS Elliston and Canyon Ferry Quadrangles accompanies this petition, including a north directional arrow and an outline of the proposed controlled area. In addition, an 8 1/2" x 11" map outlining the study area is included as Attachment 6.

The proposed North Hills CGA includes the following sections:

T11N R3W Sections 4, 5, 6, 7, 8, 9, 16, 17, 18, 19
T11N R4W Sections 1, 2, 3, 4 (Eastern half), 9 (Eastern half), 10, 11, 12, 13, 14, 15, 22, 23, 24
T12N R3W Sections 28, 29, 30, 31, 32, 33
T12N R4W Sections 21, 22, 23, 25, 26, 27, 28, 33 (Eastern half), 34, 35, 36

There are no known installations of groundwater recording equipment.

Well locations for Townships 11 and 12 North, Ranges 3 and 4 West, as mapped from the Montana Natural Resources Information Center website (with a link to the Montana Bureau of Mines and Geology Groundwater Information Center) http://nris.state.mt.us/mapper are included in Attachment 7.

Well logs are attached in electronic format on 3 1/2" floppy disks.

4. **Land Ownership**: ***Attach a list to this petition of all the land owners within the proposed boundaries of the controlled groundwater area. Land ownership may be found at the county assessors offices. The list must include the name and complete mailing address of the property owner.***

Land owners and addresses are listed in Excel spreadsheet format and are attached in electronic format on 3 1/2" floppy disks. Petitioners request that hearing notices to the same well and land owner **not** be duplicated in an effort to reduce mailing costs.

4. **SIGNATURES**: Attached

ADDITIONAL INFORMATION: A public information meeting about the proposed North Hills CGA was held on Wednesday evening, June 27, 2001, at 111 N. Sanders. The meeting agenda and presenters are included in Attachment 8. The meeting was recorded, and tapes will be provided upon request. A list of meeting attendees is attached (Attachment 8). Questions and comments received on cards provided at the meeting are:

1. Please look into the springs and underground flow in the North Hills.
2. Please take the time now to study the availability of water to sustain a growing population.
3. What water volumes have been obtained from test wells drilled east of I-15, west of Glass Drive, and north of Lincoln Road?
4. What geologic lenses (bentonite, clays, etc.) have been identified in the well logs in that area - (I have a 60 foot lense layer of bentonite in my well)?
5. Why do all the people MOVING to the North Hills need a "green lawn"? How about a presentation on xeroscape landscaping?
6. Zoning is <u>our</u> way of controlling <u>our</u> environment, as opposed to others coming in and paying for wanted changes to their way of thinking.
7. What/how many water aquifer levels have been <u>SCIENTIFICALLY</u> identified in the North Hills?
8. There is current (2000-2001) thesis research occurring by a Master's Candidate in hydrogeology at Montana School of Mines, at Montana Tech in Butte. Has this information been sought or obtained?
9. Well drillers in County - how about Northern Jefferson County, and northwest Broadwater County?
10. Perhaps the water project completed in the 1950's to drain the area south of this area should be reversed?

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[1] Thamke and Reynolds, "Hydrology of the Helena Area Bedrock, West-Central Montana, 1993-1998", Water Resources Investigation Report 00-4212, United States Geological Survey

AMENDMENT TO PETITION SUBMITTED TO DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION FOR A NORTH HILLS CONTROLLED GROUNDWATER AREA

Submitted to DNRC
July 30, 2001

The following information is provided to support this amendment to the original North Hills Controlled Groundwater Area (CGA) petition submitted to the Department of Natural Resources and Conservation on July 2, 2001. Subsequent to the North Hills CGA public information meeting held on Wednesday evening, June 27, 2001, at 111 N. Sanders, well owners in the area east of the boundaries described in the original petition expressed a desire to be included in the North Hills CGA petition. This amendment is based on groundwater availability and water quality concerns identical to those outlined in the original petition.

To reiterate the request as stipulated in the original petition:

North Hills Controlled Groundwater Area Petitioners are requesting that DNRC perform a comprehensive hydrogeologic study of the designated area as needed to characterize and quantify the current and future availability of groundwater. Petitioners also request that DNRC, in cooperation with the Montana Department of Environmental Quality, assess the nature and extent of changes in groundwater quality as a function of current and projected beneficial uses in the proposed North Hills CGA.

To protect existing water rights and prevent further harm to existing water users and water right holders in the North Hills CGA, Petitioners are requesting closure of the area to further appropriation of groundwater, except for replacement wells, during the term of the study.

Map: A 28" x 36" map comprised of the USGS Elliston and Canyon Ferry Quadrangles accompanies this petition amendment, including a north directional arrow and an outline of the proposed controlled area. In addition, an 8 1/2" x 11" map outlining the study area is attached.

Area: This amendment includes an expansion of the originally designated North Hills CGA and now includes the following sections:

T11N R3W	Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
T11N R4W	Sections 1, 2, 3, 4 (Eastern half), 9 (Eastern half), 10, 11, 12, 13, 14, 15, 22, 23, 24
T12N R3W	Sections 26, 27, 28, 29, 30, 31, 32, 33, 34, 35
T12N R4W	Sections 21, 22, 23, 25, 26, 27, 28, 33 (Eastern half), 34, 35, 36

Wells: Well locations for Townships 11 and 12 North, Ranges 3 and 4 West, as mapped from the Montana Natural Resources Information Center website (with a link to the Montana Bureau of Mines and Geology Groundwater Information Center) http://nris.state.mt.us/mapper are included in the original petition.

Logs: Well logs for the additional sections are attached in electronic format on a 3 1/2" floppy disk.

Land Ownership: Land owners and addresses for the newly included sections are listed in Excel spreadsheet format and are attached in electronic format on a 3 1/2" floppy disk. Petitioners request that hearing notices to the same well and land owner **not** be duplicated in an effort to reduce mailing costs.

Signatures: New petitioner signatures are attached.

New petitioners concur with the facts alleged and identified in the original petition and believe that the requested study is necessary for DNRC to fulfill their mission statements for the North Hills area.

To reiterate, petitioners also anticipate that the majority of study tasks and costs will be correctly and properly funded by the agency. Petitioners have limited resources and many have already been financially compromised by the need to replace their domestic water supplies, in addition to the lost investment of dry wells. Consequently, petitioners cannot bear the financial burden for the extensive and detailed investigations and analyses likely to be needed to support the proposed North Hills CGA. In addition to the scientific information provided as part of the original petition (at petitioners' expense), petitioners will cooperate with the DNRC in efforts to seek and obtain grant or other private or public funding to support the requested North Hills CGA study. Petitioners also request the right to review any proposed DNRC action requiring non-agency funding in relation to North Hills CGA study.